GAS JOURNAL

VOL. 260. No. 4510 101ST YEAR NOVEMBER 9, 1949

STAFF COMPENSATION

AFTER prolonged negotiations between the Ministry of Fuel and Power, the Gas Council, and the recognised representatives of gas engineers, staff, and employees, a draft of 'The Gas (Staff Compensation) Regulations, 1949,' was submitted for the approval of both Houses of Parliament just four days within the time limit ('not later than six months after the vesting date') specified in Section 60 (6) of the Gas Act. The draft regulations, of which we summarise the general purport on another page, require the Gas Council and the area boards to pay compensation to officers who suffer loss of employment or loss or diminution of emoluments or pension rights in consequence of nationalisation, including officers of the British Gas Council, Federation of Gas Employers, National Federation of Gas Coke Associations and its affiliated Associations, and the Association of Gas Corporations. They also provide for the payment of compensation by the Ministry to meter inspectors, assistant meter inspectors, and gas examiners suffering similar loss through nationalisation. The first classification includes persons taken into the employment of the area boards and the Gas Council in the period between the passing of the Act and vesting date who, but for such service, would have ranked as officers of vested undertakings.

The Regulations, totalling 24, grouped into six parts, and extending to 20 pages, qualify those eligible to claim compensation as persons who have devoted 30 hours or more per week to their posts over a period of not less that eight years. Claims must be made within two years of the loss suffered as a consequence of nationalisation, and no person will be entitled to compensation on the ground of anything occurring after the expiry of 10 years from vesting date. The procedure to be adopted in making claims and the nature of the information required are clearly defined, and provision is made for appeal by aggrieved persons to a 'tribunal' comprising a referee or board of referees appointed by the Minister of Labour and National Service, after consultation with the Lord Chancellor (or, in Scotland, with the Secretary of State), whose findings shall be final and binding on the appropriate authority and the persons concerned. In cases where pre-nationalisation service was rendered to undertakings which became vested in more than one area board, compensation will be payable by the board which acquired the undertaking by which the claimant was chiefly employed, and the other area boards will contribute proportionately to the amount awarded, disputes in this respect being settled by the Minister. In the assessment of compensation regard will be had to many factors, including the terms of any employment obtained since the date of any loss, and the amount of compensation awarded may be reviewed if circumstances change, at any time within two years of assessment.

The draft regulations are a masterpiece of Parliamentary draughtsmanship and phraseology—necessarily so because of the complicated nature of the circumstances involved and the genuine desire on the part of those who are now responsible for the conduct of the industry to give a square deal to those whose status has been rendered less favourable through no fault of their own.

CURRENT PROBLEMS

IN our issue of October 19 we published a most interesting and encouraging account of the work, plans, and aspirations of the North Eastern Gas Board by Mr. G. E. Currier, the Deputy Chairman, in which he gave prominence to the board's consideration of the human factor, on which results primarily depend, and underlined that within the area every effort is being made to give the man on the spot the responsibility and authority to deal with the day-to-day problems as they arise. Decentralisation is the keynote of the organisation. Today we publish an equally interesting and encouraging account of the administrative plan of the Eastern Gas Board by Mr. J. H. Dyde, the Deputy Chairman, who presents his story not as an example of how things should be done but as a record of an early experiment, 'the first of a series which time and experience will perhaps amend.' Mr. Dyde, too, stresses that the underlying aim is to provide the fullest scope for individual initiative and to permit that each shall make his or her contribution to the success and well-being of the gas industry in the area. The chief officers of the local undertakings have been attuned to accept responsibility. It is obviously to the advantage of the board that their intimate knowledge of local affairs should be

used to the full. And initiative cannot be preserved unless mistakes can be tolerated. 'I would,' remarked Mr. Dyde, 'rather see an official free to act on his own judgment than stultified by endless regulations emanating from headquarters as to how he should act on every occasion, fearful of the consequences of making a mistake.' Again, while there are evident advantages from the aggregation and centralised control of production units, consumer service cannot be centralised; it is too personal a service.

Mr. Dyde is a busy man. Junior Vice-President of the Institution of Gas Engineers, he is also President of the Southern Association of Gas Engineers and Managers, and his outline of the work of his board formed, in fact, part of his presidential address to the Association. The address also contained comment on current problems affecting gas supply generally. His reference to arrears of maintenance is an example. Arrears are serious, particularly among the smaller undertakings, which may have to be subsidised until they can be provided with a bulk supply or until new plant can be provided. The financial burden is no light one, but the programming of reconstruction and development work is, under area board organisation, possible to a degree which could not be attained with individual units each operating under independent management. Cheap gas for the small consumer is not, however, in sight; and there is plenty to think about in Mr. Dyde's brief but telling reference to large scale development to meet the needs of satellite towns which are taking shape within the Eastern area. We would call attention, too, to what Mr. Dyde had to say about effluents disposal, one of the most urgent matters facing the gas industry today a problem calling for co-operation and goodwill on all sides. This question was by no means overlooked by Mr. Currier in his account in the *Journal* of October 16, and we hope to be in a position soon to publish the results to date of the pioneer work in this direction at Tingley and Bolsover.

TECHNICAL DICTIONARIES

THOSE of our readers who acquired a copy of the 'Gas Industry Vocabulary' recently offered for sale by the International Gas Union (though published in 1937) will be interested in a translation of the October editorial of *Chimie et Industrie* which we print on p. 347. Those who were a little disappointed with this attempt to provide a trilingual vocabulary of the gas industry will see how great are the difficulties which confronted the compilers. They may perhaps also be surprised to learn how few are the satisfactory technical dictionaries, how few that can be considered veritable working tools, complete, up to date, absolutely reliable, and leaving no doubt in the mind of the user.

The difficulty is best shown in a comparison between such polyglot dictionaries as Schlomann, or this trilingual effort, and the straight two-language dictionary. The former class, especially when it runs to six languages, almost assumes the existence of exact synonyms between one language and another, whereas the fact is that words, as they grow, drift apart in meaning and often in different directions in different languages. And it is nearly, if not quite, impossible in the polyglot dictionary to give concrete examples of words in use. That this can be done in the two-language dictionary is shown by such excellent little books as Patterson's German-English and French-English dictionaries for chemists. And here we should note that the English reader needs a dictionary based on the foreign language, a dictionary, for instance, which, if he is reading French literature gives him the meaning in English of the French word, not the French meaning of the English word. He needs another dictionary when he is reading in German. The attempt to combine the two is doomed to failure, if only because of the difficulty with examples in the idiomatic use of the words. Did not our own great lexicographer, Sir James Murray, say that a dictionary without examples was like the bones of a body without the flesh—or words to that effect?

There are difficulties enough. One of these is the danger of perpetuating obsolete terms, a danger which should be obviated when the work is checked by those with living first-hand knowledge of the subject-matter. Unless compilers are closely associated with their subject there will be mistakes. ('Steaming' is not expressed by our French colleagues in the phrase 'l'injection de vapeur,' but, quite simply, 'le steaming.')

The compilation of a technical dictionary worthy of the name requires much time, money and pains. Members of the International Union would no doubt readily devote the necessary time and pains to the compilation of a gas industry dictionary, but, as publishers of gas literature know to their cost, it is doubtful whether the industry could or would put up the necessary financial support for a dictionary to be sold separately from the *Proceedings* of the Union. What could be done, however, is to attach to each communication a glossary of those technical terms *and idioms* which are likely to give trouble to readers whose mother tongue (or the tongue in which they generally read technical literature—not always the same thing) is different from that of the communication in question. Assuming that the three languages of the *Proceedings* are, and continue to be, English, French, and German, these glossaries, to attain perfection, should define the terms and idioms used in each of the communications in each of the two other languages. They would still be in three columns, but the language of the particular communication would stand in the first column of the appended glossary. Such a glossary, for example, as we have in the 'Gas Industry Vocabulary,' would serve for the use of French and German readers of English communications; for English readers of French or German papers it is practically useless. With an almost miraculous combination of the right men for the job the result should be as nearly satisfactory as the gas industry is likely to achieve under prevailing conditions.

FREEDOM OF SPEECH

OLDEST of the District Associations south of the Border, the Southern Association of Gas Engineers and Managers has the unique distinction of numbering among its 350 members officers of no fewer than half the areas in England into which the gas industry has been divided. One of its members is President of the Institution of Gas Engineers and Chairman of the South Western Gas Board, and its present President and several past Presidents carry important responsibilities at area and

divisional levels. In its 74th year its strength and virility are undiminished, largely because throughout its history it has adapted itself to changes in the structure of the industry. Long before nationalisation took effect it recognised the need for some corresponding strengthening of the ties between the District Associations and the parent Institution, and took the first step towards their conversion into District Sections, aiming at decentralising much of the work of the Institution by extending the platform on which the technicians of the industry may discuss their problems in an atmosphere removed from business policy and politics. Commercial matters which used to be discussed by the Associations must obviously be the province of the Gas Council and the area boards, and the Institution with its District Sections must maintain a free platform for the scientist and the engineer. The friendly relations between the two sides of the industry were evident at the annual meeting last week, when Mr. O. R. Guard, Chairman of the Southern Gas Board, praised the comradeship and friendship—never more needed than today—which the District Associations had brought into the industry. Some outspoken comments on nationalisation, of which he confessed himself an ardent advocate, were made by Sir Ernest Smith. Declaring that many of the mistakes made in the nationalisation of coal and electricity had been obviated at the Government's third attempt, he warned against two dangers, overplanning at divisional level and rashness on the part of officials elevated from single undertakings to group responsibilities, both of which, he suggested, could be avoided by taking time to settle down, and by refraining from applying special treatment until it had been proved to be justified in special cases.

DISTRICT ASSOCIATIONS

REPRESENTATIVES of each of the nine district gas associations affiliated to the Institution of Gas Engineers met the General Purposes Committee of the Council of the Institution at Gas Industry House last week to consider jointly suggested rules to govern the formation of district sections of the Institution. After a detailed and constructive discussion the draft rules before the meeting were amended and approved. The agreed rules will apply to any district gas association which notifies the Council of the Institution that it desires to become a district section of the Institution. The initiative must come from the district association itself.

BRITISH ROAD TAR

IMPRESSIVE statistics were given at the annual meeting of the British Road Tar Association. Approximately 2½ mill. tons of crude tar is produced annually from gas and coke oven plants in Great Britain, and the tonnage will increase steadily as the increasing demands for gas and coke are met. Of the total, 14% is produced in coking plants owned by the National Coal Board, 63% by the gas industry, and the remainder in coking plants owned by the not-yet-nationalised steel industry. Road tar production last year was 772,000 tons, of which 183,000 tons was exported. About 23% of the crude tar is distilled in plant owned by the National Coal Board, and the area gas boards, and the other 77% is distilled by independent distillers largely under co-operative arrangements between producers and distillers, or in plants owned by the steel industry. Co-operative research which the Association undertakes with the D.S.I.R. on a 50/50 basis has proved of great importance. Laboratory investigations are full scale road trials have made noteworthy contributions to British Standard Specifications for tar macadam and tars for road purposes, and to the official recommendations for tar carpets and tar surface dressings. Full scale road experiments on the use of a wetting agent to enable surface dressing to be conducted efficiently in spite of vagaries of the normal English weather are now in progress as a result of research work on the materials and methods of application which has been undertaken by the Road Research Laboratory. Linked with the increasing attention which is being given to the application of scientific knowledge to road construction is the use of the materials. To realise this objective close contact is being maintained with highway authorities, manufacturers of coated macadam, and road contractors, and by this means substantial advances have been made in the processes and methods of using road tar. The necessity for an efficient road system to meet the needs of the concentrated industries of this country are recognised and there is no doubt that, as the financial position is eased, there will be great demands for road work.

PRICE INCREASES POSTPONED

THE Gas Act placed on the area boards the obligation to reduce as far as practicable the price of gas and coke and at the same time to ensure that revenue 'will . . . . be not less than sufficient to balance expenditure.' Like all the other 11 boards, the South Western Gas Board made it one of its first duties to prepare a budget, which revealed a potential loss of £617,000 on the year's working at the prices charged for gas on vesting date. Price increases averaging 1½d. per therm were therefore announced on June 27. Mr. I. J. Pitman, M.P. for Bath, at once claimed that the increases were illegal because the board had failed to show the methods and principles on which the charges were to be made, and later called on consumers in his constituency to defer payment of any accounts rendered at the new prices. Last Friday, Mr. C. H. Chester, Chairman of the board, announcing a postponement of the new prices, said: 'The whole question turns on the provision of a section of the Act which in the opinion of eminent counsel is open to more than one interpretation. To obtain a final decision by the law courts might well involve protracted litigation. The board feels it would not be in the interests of consumers if a question affecting the price of gas were thus left in suspense. Therefore, to avoid any inconvenience which might otherwise be caused, it has decided to publish at an early date a revised notice in substitution for the previous notice.' Adjustments will be made in the case of accounts already paid at the higher rate. As we go to press we learn that the matter is to be raised in the House of Commons this week. A statement from the Conservative Central Office mentioned that other areas had also increased their charges and there was doubt about the position of consumers in other parts of the country. The Minister of Fuel and Power is to be asked to clarify the whole situation.

On the general question of gas prices Mr. J. A. Boyd-Carpenter, M.P. for Kingston-on-Thames, asked the Minister on October 31 whether, in order to implement his undertaking to consumers that they would secure cheaper gas from a nationalised gas industry, he would make a statement as to the directions of a general character he proposed to issue to the Gas Council and area boards to stop further increases in price. Mr. Gaitskell pointed out that as the boards have a statutory obligation to cover their costs, taking one year with another, he did not intend to issue any such directions. Pressed to answer whether he meant that he had no intention of implementing his undertaking to consumers, the Minister quoted from Hansard on the second reading of the Gas Bill and said that it was perfectly plain that he had said that gas would be cheaper under nationalisation than under private enterprise; he still held that to be the case. A short passage of arms ensued. Colonel O. E. Crosthwaite-Eyre, M.P. for New Forest, could not reconcile the Minister's remarks with the facts of price increase; Mr. Gaitskell riposted: 'I should have thought it was perfectly obvious, even to the hon. and gallant Gentleman, that when the area boards put up the price of gas almost immediately after vesting date, it must have been because of the increased costs incurred before vesting date.'

Letter to the Editor

SULPHUR FROM SPENT OXIDE

DEAR SIR.—In your issue of October 26 you published an abstract of an article by L. Fassina in *Chimie et Industrie* in which it was stated that 'sulphuric ether' (presumably ordinary ethyl ether) is a useful solvent for the determination of sulphur in spent oxide; it is said to dissolve the sulphur but not the tar from the oxide.

May I point out that there is danger of a very violent explosion occurring when ordinary ether is evaporated in presence of sulphur, because ethyl peroxide is quite commonly present in ether, developing spontaneously in the pure product on storage. The addition of various substances to prevent the development of the peroxide has been recommended from time to time but according to Bailey & Roy(1) none of the recommended methods of preventing its formation was found to be completely successful.

A number of writers have stated in the chemical journals in recent years that serious accidents and even fatalities have occurred when using ether in laboratory practice (1) (2) (3) (4) (5) and the experience related below shows that, in the presence of sulphur, the explosion of ethyl peroxide on heating becomes very much more violent than when heated alone.

Some years ago the writer was evaporating on a water bath about 70 ml. of an ethereal extract of sulphur from spent oxide, when an explosion of extreme violence took place(5). The flask was blown to powder. The flat bottom of the enamelled iron water-bath was bulged out an inch into a convex shape. Several nearby reagent bottles and a burette were perforated without being broken by flying fragments of glass. The water-bath, however, diverted the explosion sufficiently to prevent injury to the writer, who was standing a few yards away.

Later on, tests were made with an old sample of ether which gave a positive reaction for peroxide to try to find out why an explosion of such extreme violence should have occurred with this widely used solvent.

In the tests made, when the ether was evaporated fairly rapidly from a water-bath no explosion occurred, whether sulphur was present or not. As ethyl peroxide boils at 65° it is apparently carried over with the ether in the normal process of evaporation. When the evaporations were made at laboratory temperature in open basins the results were variable, a residue which exploded on heating with sulphur over a bare flame being left in one test, but not in others. But if a few drops of water were added to the ether and the mixture allowed to evaporate slowly, then a small residue was obtained which on heating in a test tube over a flame exploded with a sharp crack, but did not burst the tube when the residue (0.6 ml.) from 20 ml. of the ether was used. If, however, 0.1 gm. of flowers of sulphur was added to such a residue and the mixture heated in a test tube as before, it exploded with a noise like a rifle shot, and the whole of the test tube was reduced to powder, in several such experiments.

It would appear that water tends to hold back the peroxide, which is sparingly soluble in it.

The conditions needed to cause an explosion would seem to be such as might frequently be present, and the evaporation of an ethereal solution of sulphur is undoubtedly extremely dangerous.

Yours faithfully,

H. F. TAYLOR.
Research Department.

Hardman & Holden, Ltd.,
Manox House, Miles Platting,
Manchester, 10.
November 4, 1949.

References:

(1) 'Danger of explosion in handling ether,' W. G. Bailey and A. Roy, J. Soc. Chem. Ind., 1946, (65), 421.
(2) 'Explosion when distilling isopropyl ether.' R. Robertson, Chem. & Ind. 1933, (52), 274.
(3) 'Explosiveness of methylated ether.' P. S. Arup, Chem. & Ind. 1936, (55), 546.
(4) 'Explosions arising from ethers.' Chem. & Ind., 1936, (55), 580.
(5) 'Notes on explosions attributed to interaction between ethyl peroxide and sulphur.' H. F. Taylor, Mem. of Manchester Literary & Philosophical Society, 1936-37. Abstracted Brit. Chem. Abst., 1937, A.II. p.318, Chem. Absts. (Amer. Chem. Soc.) 1937, (31), 6008.

Personal

Mr. **R. H. Studholme** has been elected to the Board of Metropolitan Gas Meters, Ltd., following the death of Mr. E. Price-Jones.

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Mr. **W. R. Oliver,** Public Relations Officer of the East Midlands Gas Board, has been on sick leave for the past few weeks. He is at the West London Hospital, Hammersmith Road, London, W.6, and his many friends will be glad to learn that his progress has been most satisfactory and that he hopes to return to work shortly.

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Councillor **W. L. Carr,** J.P., L.R.I.B.A. (Northwood) and Alderman **C. W. Jockman** (Ealing), have been appointed members of the North Thames Gas Consultative Council. Mrs. **I. M. Godman** (Great Smeaton, Yorks), Mrs. **F. G. Hardy,** J.P. (Stocksfield, Northumberland), and Mr. **F. Ellison** (Silloth, Cumberland) have been appointed members of the Northern Gas Consultative Council.

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Mr. **A. H. Andrews,** Controller of the Metropolitan Division, South Eastern Gas Board, retired on October 31. Mr. Andrews, who is 62, joined the South Metropolitan Gas Company as Superintendent of the Stove and Fitting Shop 35 years ago. Six years later he was appointed Engineer of the Vauxhall works, and, in 1927, became Engineer of the Company's largest works at East Greenwich. He was Joint Manager of the South Metropolitan Gas Company from 1933 until 1937, and Chief Engineer and Works Manager until vesting date.

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Mr. **E. Williams,** Works Manager, Uxbridge District, North Thames Gas Board, has been appointed to the position of Divisional Engineer, Norwich Division, Eastern Gas Board. After training at Ormskirk, Lancs, and securing First Class Certificates with Distinction in both Gas Engineering Manufacture and Supply, Mr. Williams went to Slough as Assistant Engineer and Manager from 1932 to 1939. During the war years, he was Production Engineer, Air Ministry Directorate of Hydrogen Production and Compressed Gases, and supervised the construction and operation of hydrogen plants in the Home Counties.

Obituary

Mr. **B. G. W. Cole,** Manchester Director of Falk, Stadelmann and Co., Ltd., has died in his 71st year. He joined the Company in 1898, commencing in the ledger department, subsequently taking charge of the accounts department and afterwards the control of sales development in the London area. In 1913 he opened a branch in Manchester and was appointed a local Director in December, 1919. In March, 1928, when the Company purchased Stoves, Ltd., he was appointed Managing Director of that firm and he brought a derelict concern into its today's flourishing condition. He undertook this work in addition to his duties at Manchester, and became a full Director of the parent Company in May, 1943.

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Mr. Charles Wood, former Engineer and Manager at Bradford, died on November 4 at the age of 85. Prior to his retirement in 1927, Mr. Wood served in the Bradford undertaking for 46 years. He was appointed superintendent at the Thornton Road works when he was 20. In 1898 he followed his father as Engineer and Manager, a position he held until his retirement. In 1920 he was awarded the O.B.E. for the assiduous manner in which he carried out many additional duties during the first world war, including services rendered to the Ministry of Munitions in connection with the manufacture of explosives by special processes. Taking an active part in the work of the Institution of Gas Engineers, of which body he was President in 1906, he also held many other offices in the industry.

MANCHESTER SENIORS IN SESSION

A MEETING of the Manchester District Association of Gas Engineers was held at the Grand Hotel, Manchester, on October 28, the President, Mr. J. D. Ashworth, Engineer and Manager of the Blackburn gas undertaking, being in the chair.

The following were appointed officers of the Association for 1950-51 :—

President : N. G. Appleyard (Leeds).
Senior Vice-President : Thomas Haworth (Wigan).
Junior Vice-President : Alexander McDonald (member of the North Eastern Gas Board).
Honorary Secretary and Treasurer : A. H. Nicholson (Colne).
Committee : W. A. Dearden Lancaster), R. L. Greaves (St. Helens), H. Johnston (North Eastern Gas Board), J. G. Tilley (East Hull).
Auditors : J. H. Richmond (Runcorn), A. F. Yates (Goole).

The members rose in silent token to the memory of the following deceased members : R. H. Duxbury, Southbank ; J. F. Smith, Solihull ; C. Diamond, Largs.

The following gentlemen were then inducted as new members of the Association : J. D. Ashworth, Deputy Engineer and Manager, Altrincham undertaking ; F. Cartledge, Engineer and Manager, Oldham undertaking ; H. G. Cooper, Deputy Chief Gas Engineer, Simon-Carves, Ltd. ; W. Morland Fox, Director in charge of projects, W. J. Jenkins and Co., Ltd. ; R. Asmotherley, Engineer and Manager, Dalton-in-Furness undertaking; C. J. P. de Winton, Engineer and Manager, Chapel Whaley undertaking ; R. E. White, Works Manager, Meadow Lane station, Leeds undertaking.

It was announced that Mr. G. Bowman, of the Stretford undertaking, in addition to receiving the first-class Higher Grade Certificate for Gas Engineering (Manufacture) had been awarded the Charles Hunt Medal.

The **President** then presented Certificates to the successful candidates in the 1949 Examinations of the Institution of Gas Engineers.

A paper jointly prepared by Mr. R. Walker (Chief Engineer, Manchester undertaking), and Mr. H. C. Applebee (Chief Chemist, Manchester undertaking) was then read by Mr. Applebee, Mr. Walker being absent through indisposition. (See pp. 353-360.)

A Temporary Exhibition entitled 'Houses in the U.S.A.' was opened at the Building Centre on October 31. The exhibition, which has been loaned by the United States Office of Information, illustrates the development of domestic architecture in the U.S. and includes photographs of much of the best contemporary work. The exhibition was produced by the Editor of *Life Magazine* and *Architectural Forum* and will remain open for one month.

The Rateable Value of Musselburgh gasworks has been reduced by the public assessor from £5,661 to £1,514, the equivalent of an additional 3d. on the rates. Musselburgh Town Council has decided to appeal next year when the rateable value of the undertaking is reviewed. Meanwhile, their case is being placed before the Convention of Royal Burghs and the help of the Lord Advocate, the Rt. Hon. John Wheatley, is being sought.

Barrhead Town Council are to protest to the Scottish Gas Board about the high price of gas in the town as compared with Glasgow, Paisley and neighbouring burghs in Renfrewshire. Councillor Climie, who proposed the protest, said that Barrhead was paying 5s. 8½d. per 1,000 cu.ft., with a reduction of 2½d. if the bill was paid by the end of the month, whereas in Glasgow the rate was 4s. 10d., Paisley 4s. 5d., and Johnstone and Renfrew 4s. 10d. and 5s. 4d., respectively. He declared that he had always considered that the price of gas in Barrhead was ridiculously high, and the town was losing £1,700 in rates because of a high assessment. The Gas Board could not say that they had not increased the price of gas when they had assessed the gasworks so that Barrhead was paying 4½d. in the £ in rates. It was different when a private company was paying dividends of 10% and 20%, but now that the undertakings were under the Scottish Gas Board, Barrhead people were entitled to think that nationalisation was at least going to make their gas cheaper.

A Visit to Peebles, Ltd.

A party of nearly 50 members of the Scottish Junior Gas Association (Western District) visited the works of Peebles, Ltd., Bonnington, Edinburgh, on October 22.

Prior to the tour of the works, Mr. **E. A. Beevers,** Managing Director, gave an informal talk on 'Gas Governors,' during which various illustrations were shown by means of lantern slides. Great interest was shown by the members and many questions were asked regarding the constructional methods and materials used in the manufacture of the different types of governor.

Following the inspection of the works, those present were entertained at tea by the firm. In thanking Messrs. Peebles for the trouble to which they had put themselves to make the visit so successful, Mr. **R. F. Bell** (Glasgow), President of the Association, said he was sure that the visit would prove of great value to the students participating.

The Liverpool and District Branch of the Women's Gas Council held their third annual Homecraft Exhibition at Radiant House, Bold Street, Liverpool, on October 12. The event attracted 350 exhibits and 75 entries, a detailed judgment of which was given by Miss D. G. Hughes, Chief Domestic Science Adviser to the Liverpool Education Committee. Prizes were presented by the Lady Mayoress of Liverpool, and Mr. C. H. Leach, General Manager of the Liverpool Group of gas undertakings, addressed an audience of more than 300.

Output per Manshift at the coalface in the week ended October 22 was 3.1 tons, and overall output was 1.2 tons per manshift—the highest figures since before the war. Total production for last week was 4,359,900 tons, compared with 4,405,100 tons the week before. There was another fall in manpower during the week ended October 22—from 710,600 to 709,500, including a loss of 500 face workers. Gas available at gasworks for the week ended October 28 was 10,330.7 mill. cu.ft., compared with 9,426.3 mill. for the previous week, and 960.5 mill. units of electricity were sent out for public supply, against 874.7 mill. over the same period.

Diary

Nov. 11.—London and Southern Junior Gas Association : General Meeting. Films on Mechanical Handling.

Nov. 14.—Eastern Gas Consultative Council, Gas Industry House, 2.45 p.m.

Nov. 16.—South Western Gas Consultative Council, Taunton, 11 a.m.

Nov. 17.—Midland Junior Gas Association : Afternoon Visit to Works of George Wilson Gas Meters, Ltd., Coventry.

Nov. 18.—Scottish Junior Gas Association (Western District) : 'The Treatment of Effluent Liquors from Gasworks,' J. J. Priestley (W. C. Holmes & Co., Ltd.).

Nov. 23.—London and Southern Junior Gas Association : Visit to E.M.I. Works, Hayes, Middlesex.

Nov. 24.—North Thames Gas Consultative Council, St. Ermins Hotel, Westminster, 2.30 p.m.

Nov. 25.—Eastern Association of Gas Engineers and Managers: Autumn General Meeting, Waldorf Hotel, London. Presidential Address, C. E. Grimwood.

Nov. 29.—Midland Junior Gas Association : Meeting, Birmingham. 'Carburetted Water Gas,' S. C. Crathorn (Birmingham).

Nov. 14.—Women's Gas Council : Executive Meeting. Gas Industry House, S.W.1. 1 p.m.

Nov. 15.—Institute of Fuel : Joint Meeting with Iron and Steel Institute. 'Dry Coke Cooling,' Dr. G. E. Foxwell. Institution of Mechanical Engineers, Storey's Gate, S.W.1. 5.30 p.m.

Nov. 30.—Women's Gas Council : Meeting of Headquarters' Members. Gas Industry House, S.W.1. 3 p.m.

Nov. 29-30.—Institution of Gas Engineers. Autumn Research Meeting.

Gas Staff Compensation

Both Houses of Parliament Approve Draft Regulations

DRAFT regulations have been approved by resolution of both Houses of Parliament to provide for the payment of compensation under the Gas Act to persons employed in the gas industry, whether by gas undertakings acquired by the area boards, by the recognised gas and coke associations, or as meter inspectors, assistant meter inspectors, or gas examiners, who have suffered loss of employment or loss or diminution of emoluments or pension rights as a result of nationalisation.

Eight Years' Service

Persons entitled to compensation under the regulations relating to employees of former gas undertakings and gas and coke associations are those who, after attaining the age of 18, had been continuously employed for at least eight years immediately before vesting date, by one or more undertakings or employed whole time for the purpose of administering undertakings or parts of undertakings. Periods of war service and of whole time study at any university, college, or school on subjects relevant to such employment, and of unemployment not exceeding in the aggregate 18 months, may be reckoned towards the qualifying period of eight years.

There is a proviso to the effect that entitlement is only for persons who were required to devote to their employment an average of 30 hours or more per week, but to bring himself within the proviso, though not for other purposes, a claimant may count all time devoted to services as a director of a company to which Part II of the Gas Act applies.

Compensation may be paid by the Minister of Fuel and Power in similar circumstances to persons who after attaining the age of 18 had been continuously employed for at least eight years before vesting date as meter inspectors, assistants to meter inspectors, or gas examiners. Under this part, periods of whole time employment by a local authority in any capacity, and of war service and unemployment, may be reckoned towards the qualifying period.

Three Stages

Factors affecting compensation as set out in the regulations include the question whether the claimant had a reasonable expectation of compensation in the event of amalgamation before vesting date. The persons entitled are divided into those with expectation of compensation and those without. There are three stages of compensation—immediate, substantive, and residual—but these are not all applicable to every case.

Persons with expectation of compensation who have lost their employment will receive immediate compensation for three months at least, based on two-thirds of the emoluments lost and, then substantive compensation until death or retiring age (except in certain circumstances). Substantive compensation is not in any event to exceed two-thirds of the emoluments lost, and except where it has been awarded for a shorter period than until death or retiring age, is not to exceed an amount calculated on the basis of one-sixtieth of the emoluments lost for each completed year of service plus an additional sixtieth for each such year after age 45. The amount of residual compensation will be equivalent to the amount of any pension and lump sum benefit of which the person entitled had expectation in respect of his service before the date of loss, plus in certain cases an additional sum in respect of years of service (not being more than 10) after age 40.

Where the employment was not pensionable, but the appropriate authority is satisfied that the person concerned had a reasonable prospect of being retained in employment for any substantial period after he attained retiring age, residual compensation equal to half his substantive compensation is in certain cases to be paid to him for the remainder of his life. Persons with expectation of compensation who have suffered loss or diminution of emoluments are not entitled to immediate or residual compensation, but will receive substantive compensation as from the date of loss on the same basis as substantive compensation for loss of employment. Those without expectation of compensation will receive immediate compensation for 13 weeks, plus one additional week (up to maximum 13) for each year of service after age 45, based on two-thirds of the emoluments lost, but no substantive compensation. Persons who have lost their employment and who had the expectation of a pension will also be eligible for residual compensation.

Appeal Tribunal

Compensation is to be assessed by the appropriate authority (the area board in the case of employees of former undertakings acquired on vesting date and the Gas Council in the case of those employed by the former gas and coke associations) and by the Minister of Fuel and Power in the case of meter inspectors and gas examiners, but a right of appeal to a tribunal—a referee or board of referees appointed by the Minister of Labour and National Service after consultation with the Lord Chancellor, or, in Scotland, with the Secretary of State—is given to any claimant aggrieved by their decisions. The amount of the compensation may be reviewed, if circumstances change, at any time within two years of assessment, or in the case of persons who have lost their employment but are later re-employed by an area board, the Gas Council, or the Minister, or who while still so employed are receiving compensation for diminution of emoluments, at any time.

No-one to whom the regulations apply will be entitled to compensation on the ground of anything occurring after the expiry of 10 years from vesting date.

Visco's New Factory at Croydon

The Visco Engineering Company's new factory at Croydon was formally opened on October 21. This replaces the factory destroyed by a direct hit from a flying bomb on June 17, 1944.

Miss Doreen Smith (daughter of the founder) unveiled a bronze plaque commemorating the bombing and rebuilding. Mr. F. Curt Smith, Chairman and Managing Director, who founded the firm in September, 1921, spoke briefly of the growth of the Company in the past and the way in which difficulties caused by enemy action had been overcome, and added that the present full order book and the increased demands for 'Visco' products provided an opportunity for continued prosperity in the future.

When the Visco Engineering Co., Ltd., was formed in 1921 its express purpose was to place on the English market the 'Visco' air filter, the first all-metal air filter using oil-film covered surfaces as the filtration medium. In those early days, the filters were made by outside contractors to 'Visco' specification, but the rapidly increasing demand soon made it necessary for the Company to undertake actual manufacturing. This began in 1924. In the same year, the first 'Visco' water cooling towers began to make their appearance at power stations and industrial establishments in different parts of the country. These coolers were designed in the Company's drawing office in London and fabricated at Boston where greater facilities for handling timber were available. As a natural development, a ventilating department was opened in 1927 and the dust-collecting department in 1928, the latter dealing particularly with the 'Visco-Beth' automatic plant.

The business continued to grow, and in 1932 the Company moved to its present site in Croydon. The increased facilities available led to a further rapid expansion of the business. Additional types of filter were developed for different kinds of work, an important step forward in the history of air filtration being made by the introduction of the Visco rotating self-cleaning filter in 1932. The range of dust-collecting equipment now manufactured extends from small units for use with single machine tools to large centralised automatic plants. The ventilating department has also grown considerably during recent years. Development has been specially satisfactory in the field of industrial heating, ventilating, and air conditioning, and many important schemes have been successfully carried out.

Owing to a printing error reference was made on p. 294 of last week's *Journal* to the 'Durham' undertaking's temporary supply to the new town at Aycliffe. This should have read 'Darlington.'

Quest for Better Roads

A Review of the British Road Tar Association's Research Activities

CREATED in 1927 by the gas, by-product coking, and tar distilling industries to promote the use of tar and tar products for road purposes, the British Road Tar Association held its annual meeting on October 26, when the current membership was reported to be as follows (the coking plants of the National Coal Board and the gas undertakings of the area gas boards being treated as separate units for the purpose of the analysis) :—

Producers : Gas undertakings subscribing through area boards, 67 ; through co-operative schemes, 66 ; direct, 4 (a total of 737 gas undertakings) ; coke ovens subscribing through the National Coal Board, 10 ; through co-operative schemes, 18 ; direct, 7 (a total of 35 coke ovens) ; total producers, 772.

Distillers : Subscribing direct, 19 ; through co-operative schemes, 12 ; total, 31 ; making a total membership of 803, representing 78% of the total crude tar produced and 80% of the road tar sold in the home market.

Road Research Laboratory

The main lines of investigation for 1949/50 to be undertaken by the Road Research Laboratory of the D.S.I.R. under its arrangement with the B.R.T.A. are : (i) A continuation of the study of the action of oxygen on tar ; (ii) further development of durability tests for tar to measure susceptibility to (a) oxidation and (b) crystallisation ; (iii) development of chemical treatment to remove or destroy the phenolic constituents in tar so as to reduce susceptibility to oxidation ; (iv) development of a 'rapid curing' tar ; (v) work on the problem of ensuring good adhesion in surface dressing when using wet stone in bad weather ; (vi) investigation into the effect of local conditions of traffic, climate, aggregate, and tar on the design and performance of tarmacadam carpets ; (vii) investigation into the design of dense tar surfacings with high stone contents for various conditions of traffic and climate ; and (viii) design of tarmacadam for road foundations.

The programme of laboratory research is backed by an extended series of road experiments, designed to correlate the laboratory results with behaviour on the road—the real test—and to determine the practical value of any new proposals. These full-scale experiments cover surface dressings, tar carpets, tarmacadam, and dense tar surfacings.

Durability Tests

A durability test by which the suitability of a tar, from the point of view of oxidation under weather conditions, may be predetermined, developed in the Road Research Laboratory, is undergoing trial in a number of laboratories of members of the Association. Some delay has been due to the difficulty in obtaining the necessary apparatus, and to the variation in results probably due to differences in test procedure. These difficulties are being overcome and it is hoped that a satisfactory test will shortly be evolved.

The problem of wetting agents is before the Association because it is realised what an advantage it would be to be able to surface dress a road without having to guard against weather conditions. The addition of the wetting agent to the tar does not in practice confer any appreciable benefit, but the laboratory tests have shown that there is an advantage in adding a wetting agent on the tar before applying the chippings. Full scale road experiments are now in hand, some 50/55 miles of road being selected for treatment in several of the notoriously wet counties of Scotland, Wales, and England, and it is hoped that a practical answer to the problem will be the outcome.

Tar Macadam and Tar Carpets

Two problems which have engaged the attention of the Technical Committee are the advisability of providing a Type 'B' tar for the manufacture of tarmacadam, and the availability of suitable mixing plants for the manufacture of the material. As regards the tar, the Committee has come to the conclusion that while, in general, it is better to use a Type 'B' tar to meet ordinary requirements for tarmacadam, satisfactory results have been and are being obtained with Type 'A' tar. The Association has therefore offered the closest technical co-operation with the members of the Federation of Coated Macadam Industries to assist in the production of the highest grade of tarmacadam. As regards the wearing course itself, a special committee consisting of sales and technical experts has been set up to investigate the scope that exists for the manufacture of wearing course materials and to submit proposals for furthering their use.

Retread Process

Considerable attention has been focussed on the retread form of resurfacing which is being adopted in various areas, where the traffic is light and where the re-shaping of the road is necessary. Provided its limitations are recognised and the type of road is suitable, the process can be a useful substitute for more expensive methods, on the grounds of present-day demands for economy, but only where the roads are suitable.

The Certification Trade Mark scheme completed its third year of operation with the close of the 1948 season. The total number of licences now operative is 37, covering 71 works in all parts of Great Britain. The tonnage of certified tar sold has risen from 191,629 in 1946 to 339,150 in 1948. The scheme, offering a guarantee of quality, has been of benefit to supplier and user alike.

Travelling Representatives

Three travelling representatives had an active season, visiting road tar suppliers and their customers in all districts, seeking to bring supplier and user into still closer contact and offering advice and assistance wherever it was desired. Their reports for the past 12 months reveal an increasing awareness of the keen competition arising from the use of bitumen which is certain to increase as a result of the greater tonnages to be produced in the new refineries.

The Special Roads Act received the Royal Assent earlier this year. While it is unlikely that the powers granted under the Act to the Minister of Transport will result in any substantial increase in the total annual expenditure which may be expected for some time, the Association considers that there is an eventual possible outlet for large quantities of road tar in the construction of the new roads. With this in mind a memorandum on bases for road construction has been submitted to the Road Tar Research Committee with the request that they should consider including in their programme some experimental work on lines suggested in the memorandum.

Industrial Relations

The first meeting of the newly constituted National Joint Industrial Council for the Gas Industry was held on October 26, when Colonel H. C. Smith, C.B.E., J.P., D.L., Deputy Chairman of the Gas Council, was unanimously elected Chairman, with Mr. Tom Williamson, J.P., as Vice-Chairman, and Mr. C. M. Plowman (representing the employers) and Mr. Fred Hayday (representing the trade unions) Joint Secretaries.

The Council approved revised constitutions for the National and Area Joint Industrial Councils.

To avoid delay in negotiations in the areas it had already been agreed in July not to await the final approval of the constitutions but to proceed with the setting up of the Area Joint Industrial Councils. These Councils are now functioning and meetings have been held in some of the areas.

Scottish Gas Prices

The Scottish Gas Board has now completed its review of the financial position of the 19 district undertakings under its control. The board states that despite higher charges for coal used for gas production, it has been found possible to make no increase in the price of gas to 116 districts. Details of the board's decision in respect of 96 districts have already been published ; the following list shows price increases (per therm) which have now been introduced in 28 of the remaining 97 undertakings :—

Aberlady, 1.11d. ; Armadale, 1.44d. ; Auchtermuchty, 1.25d. ; Bo'ness, 2d. ; Busby, 2d. ; Callander, 1.279d. ; Castle Douglas, 1.66d. ; Eyemouth, 0.5d. ; Innerleithen, 0.652d. ; Inverurie, 2.133d. ; Jedburgh, 1.707d. ; Kirriemuir, 0.941d. ; Kingskettle, 1.19d. ; Linlithgow, 1.628d. ; Lockerbie, 2.66d. ; Maybole, 1.11d. ; Melrose, 1.375d. ; Millport, 1d. ; Polmont, 1d. ; Skelmorlie, 1.11d. ; Strathmiglo, 2.22d. ; Tayport, 1d. ; Wick, 1.714d.

Price increases per 1,000 cu.ft. : Aberfeldy, 12d. ; Biggar, 12d. ; Moffat, 3d. ; Newton Stewart, 5d. ; Stewarton, 2½d.

More Gas Stock Values

For Holders of Companies' Securities

THE list of gas valations requires £2.1 mill. of Gas stock to cover the 129 stocks of the 55 companies concerned. Including this total, Gas stock has now been isued to the value of £123.8 mill. Following the announcement of these new compensation values, the value of Gas stock, which is issued for compensation purposes at 100, declined on November 2 to 86¼, its lowest level to date.

Stocks of two composite gas and water companies—Barnet and Hartlepool—have also been valued by the Ministry of Fuel and Power as far as gas interests are concerned. In an announcement from the Ministry on October 28, the proportions of net revenue earned by the gas interests of these two companies were given as 53.36% and 60.4%, respectively. In the following list of compensation values securities are in units of £100 unless otherwise indicated.

Company	Compensation Value
Alford 4% Deb.	£100
Do. Orig.	£50
Do. Orig. (£10 unit)	£5
Annan 6% Cum. Pref. (£1 unit)	26/6
Do. Ord. (£1 unit)	32/–
Ash next Sandwich Ord. (£5 unit)	£10/5/–
Barmouth 4% Red. Deb.	£101
Do. Ord. (£10 unit)	£21/10/–
Blairgowrie Ord. (£10 unit)	£16
Brecon Pref. (£10 unit)	£10/1/–
Do. Orig. (£10 unit)	£13
Do. New (£10 unit)	£9/5/–
Bridgewater 5% Perp. Deb.	£125
Do. 4% Perp. Deb.	£102/10/–
Do. 4% Red. Deb.	£102
Do. 4% Red. Pref.	£100/10/–
Do. Consol.	£161
British Gas Light 7% Cum. Pref.*	£150
Busby & District Ord. (£10 unit)	£9/10/–
Chertsey 6% Pref.	£134
Do. 4% Red.Pref.	£100/10/–
Do. 10% Stand. Ord.	£250
Do. 7% Stand. Ord.	£200
Do. 5% Stand. Ord.	£140
Cowbridge Ord. (£1 unit)	50/–
Cradley Heath 3% (Tax Free) Deb.	£112/10/–
Dolgelley Ord. (£10 unit)	£10/16/–
Dowlais Consol. Ord.	£90
Dunblane Ord. (£1 unit)	30/–
East Anglesey 5% Mort. Deb, Jan. 1, 1950	£101
Do. 5% Mort. Deb., Feb. 4, 1950	£101
Do. 4½% Mort. Deb.	£100
Do. Orig. Ord.	£50
East Surrey 4% Deb.	£102/10/–
Do. 3½% Red. Deb., before Jan. 1, 1946	£102
Do. 6% Cum. Pref.	£134
Do. 5½% Pref. 'A'	£128
Do. 4½% Red. Pref.	£108
Do. Ord. 'B'	£110
Godalming 5% Orig. Pref. (£5 unit)	£5/12/–
Do. 5% New Pref. (£5 unit)	£5/12/–
Do. Orig. Ord. (£20 unit)	£41
Do. Orig. Ord. (£10 unit)	£20/10/–
Do. Orig. Ord. (£5 unit)	£10/5/–
Do. New Ord.	£145
Do. New Ord. (£10 unit)	£14/10/–
Grantham Consol.	£160
Gravesend and Milton 5% Irred. Deb.	£125
Do. 5% Pref.	£115
Do. Ord.	£150
Holyhead and North Wales Ord. (£1 unit)	27/6
Horley 4% Deb., before Jan. 1, 1946	£103
Do. 4% Mort. Deb. (£50 unit)	£50/10/–
Do. 5% Pref.	£114
Do. 4½% Red. Pref.	£103
Do. 'A' Cap.	£210
Do. Addl. 'B'	£150
Kinross and Milnathort Ord. (£1 unit)	37/6
Kirkham Orig. 'A'	£160
Lewes 5% Perp. Deb.	£125
Do. Orig. Cap.	£210
Do. Addl. Cap.	£147
Leyland Ord.	£122/10/–
Llandilo 5% Red. Mort. Deb.	£100/10/–
Llandovery 4% Red. Deb.	£100
Do. Ord. (£5 unit)	£8/6/8
Llynvi Valley 5% Pref. (£10 unit)	£10
Do. Ord. (£10 unit)	£6/10/–
Do. Ord. 'A' (£10 unit)	£4/11/–
Louth Orig. (£25 unit)	£62/10/–
Do. New Ord. (£200, £45 paid)	£90
Do. Improvement 'A'	£110
Do. Improvement 'B'	£110
Maidstone 3% Perp. Deb.	£85
Do. 5% Cap.	£175
Market Deeping Ord. (£10 unit)	£23
Mid-Kent 6% Pref. (£10 unit)	£13/8/–
Do. Orig. Cap. (£10 unit)	£9/4/–
Minehead 4½% Red. Deb.	£104
Do. 5% Red. Pref. (£1 unit)	21/2
Do. Ord. (Orig.) (£1 unit)	33/–
New Romney Orig. Ord.* (£5 unit)	£5/2/6
Do. Addl. Ord.* (£5 unit)	£5/2/6
Normanton Orig.	£310
Do. Addl.	£260
Pembroke Orig. 'A'	£194
Do. Orig. 'B'	£137/10/–
Pudsey New Consol	£220
Rhayader Ord. (£5 unit)	£5
Rhos Ord. (£5 unit)	£9
Do. Ord. (£5, £3 10s. paid)	£6/6/–
Riddings Ord.	£180
Royston Ord. (£10 unit)	£20
St. Asaph Ord. (£5 unit)	£5/10/–
Do. Ord. (£2 10s. unit)	£2/15/–
Sheppy 5% Perp. Deb.	£125
Do. 6% Pref.	£134
Do. 4% Pref.	£103
Do. 4% 'A' Pref. (£10 unit)	£10/6/–
Do. Consol. Ord.	£90
Sileby Ord. (10s. unit)	20/–
Soham 5½% Red. Pref.	£105
Do. Orig. Ord. (£10 unit)	£24
Stourvale 4½% Pref. (£1 unit)	22/–
Do. Ord. (£1 unit)	23/–
Tawe Valley 4½% Deb.	£110
Do. 5% Red. Pref. (£10 unit)	£10
Do. Orig. (£10 unit)	£8/10/–
Do. Addl. (£10 unit)	£6
United District 6% Orig. Pref. (£10 unit)	£13
Do. 6% Addl. Pref. (£10 unit)	£13
Do. Orig. Ord. (£10 unit)	£16/10/–
Do. Addl. Ord. (£10 unit)	£12/16/–
Warwick 4½% Deb.	£112/10/–
Do. 5% Pref.	£112/10/–
Do. Ord.	£113
Watchet and Williton Ord. (£5 unit)	£13
Do. Ord. (£1 unit)	52/–
Wellington (Somerset) 6% Deb.	£145
Do. 4% Deb.	£102/10/–
Do. 4½% Red. Deb.	£104
Whitchurch (Hants) 4½% Red. Deb.	£106
Do. Ord.	£137/10/–
Whitstable Ord. (£20 unit)	£41/12/–
Do. Ord. (£10 unit)	£20/16/–
Yorktown (Camberley) 5½% Perp. Deb.	£133/10/–
Do. 5% Consol. Pref.	£113
Do. 4% Red. Pref.	£101
Do. Consol. Ord.	£121

* The value of these unquoted securities has been determined in accordance with Sections 25 (10) and 26 (4) of the Act.

Composite Gas and Water Company	Compensation Value
Barnet 5% Deb.	£130
Do. 4% Deb.	£107
Do. 4% Red. Deb.	£104/2/10*
Do. 4½% Pref.	£117
Do. 4% Pref.	£120/16/–*
Do. 5% Red. Pref.	£104/10/–
Do. Ord.	£162/3/4
Hartlepool 5% Red. Deb., 1958	£105/10/–
Do. 5% Red. Deb., 1957	£105/10/–
Do. 5% Red. Deb., 1950-60	£103
Do. Ord.	£99/10/–

* The value of these securities has been determined as the average price of issue ascertained in accordance with Sections 25 (5) or 25 (6) of the Act, as the case may be.

Civils' Presidential Address

In his presidential address to the Institution of Civil Engineers on November 1, Mr. V. A. M. Robertson, Chief Engineer of British Railways, Southern Region, said that there was still great scope for research and improvement in methods of heating. The British Railways used about 2 mill. tons of coal annually for space heating alone in open grates, stoves, and in central-heating boilers, apart from the large consumption of gas and electricity for both space heating and water heating, and substantial economies could therefore be realised.

Co-existent with the problem of heating was that of adequate ventilation. Staff could only work to a standard of maximum efficiency in buildings which were not only properly heated but also were adequately ventilated and lit, and the provision of proper amenities in that respect, together with hot water for washing, was not only justifiable on hygienic grounds, but yielded a large dividend in the form of better work.

Among the many important changes which had taken place in the British Railways, Mr. Robertson mentioned the mechanisation of office methods, developments in the medical branch of the service, the introduction of incentive schemes, and the control of productivity in civil engineering production shops.

From Ranalah, Ltd., we learn that the firm is in full operation at Lutterworth Road, Burbage, Leicestershire, and is in a position to deal with all enquiries regarding its water heaters, drying and airing cabinets, gas conversion units for laundry purposes, &c.

The Headquarters Section of the Women's Gas Council visited the Potterton Gas Division of Thomas De La Rue & Co., Ltd., at Wandsworth recently and inspected infra red equipment. Perfecta thermostatic controls, boiler assembly, and the new B.6 larger capacity cooker. The visitors saw the colour film, 'A Visit to the De La Rue Foundry at Warwick,' and examined work in progress in the laboratories. Mrs. Buchanan, Organising Secretary of the Women's Gas Council, and Miss Ellington Wright, Chairman of the Headquarters Section, were among those received by Mr. T. F. C. Potterton and Mr. E. G. Brooks, General Manager.

Technical Dictionaries

The following is a translation by Our Own Correspondent of an Editorial which appeared in *Chemie et Industrie*, Vol. 62. No. 4.

THE question of technical dictionaries has been recently again under discussion in the Technical Press across the Channel. As so often happens in the British Press, whether daily or periodical, the first article which to some degree 'calls the tune' gave rise to commentaries by readers interested in various ways in the problem and who were apparently only waiting for this to put forward their points of view.

The exchange of technical information between different countries postulates above all, says the author, exact translations which can evidently only be executed by highly qualified specialists with the indispensable dictionaries at their disposal. Of these there is no lack, he says, but unfortunately they are only rarely quite up-to-date in the field they cover. We should go further and say that if technical dictionaries are numerous those are relatively rare which can be considered veritable working tools, complete, up to date, absolutely trustworthy, and leaving no doubt in the mind of the user. This is probably because for a long time it has been sought to include in collections of this kind the whole of technique, an enterprise which has become more and more illusory with the rapid progress in different branches of technique. The solution of the problem appears to be, on the other hand, to limit each dictionary within a field with frontiers closely defined, a limitation which will quite often result in a volume of considerable size. To quote a remark in the preface of an excellent little pocket technical dictionary 'the number of technical terms sanctioned by the Academy or by usage is, in France, greater than that in current language.' On the other hand, the compilation of such a work is a long job, requiring several years of preparation and involving supervision and scrutiny in minute detail.

The author cited refers, by way of example, to two polyglot dictionaries well known to technicians. The first is the illustrated technical dictionary in six languages devoted to electrotechnics and electrochemistry published in 1928 by Alfred Schlomann, following the first edition of 1907; the other the 'Dictionnaire Technique Illustré' commenced in 1932 under the auspices of the Association Permanente des Congrès de Navigation; this, too, is composed in six langauges but with the difference from Schlomann that Dutch is included instead of Russian. Up to 1939, of 15 volumes announced five had seen the light of day, and it is to be hoped that this extensive work may be pursued.

One can appreciate the difficulty there must be in obtaining the indispensable financial support, then in assembling a body of competent specialists with a thorough knowledge of the terminology in one or other domain, perfectly versed also in one or several foreign dialects, and capable finally of bringing to such work the rigorous method required.

From this point of view the preface of Schlomann is instructive. 'The elaboration of dictionaries embracing a certain number of known languages following a scientific plan and designed to satisfy the reader by offering him practically all he needs, constitutes a labour not only irksome but extremely costly.' The editor had appealed, with success, to the interested ministries in Germany and through them to a variety of powerful scientific and industrial associations and to a phalanx of professors and specialists all over the world. From the commencement of the work of preparation to coming from the press, no less than nine years elapsed.

In a different field, that of the automobile, the Anglo-French dictionary of L. L. Sell, published in New York in 1932, may be cited. The raw material was furnished by several thousands of catalogues, manuals, dictionaries, &c., but recourse was also had to more than 300 constructional companies. Finally, two other examples of technical dictionaries may be mentioned: the trilingual lexicons prepared to facilitate the combined naval manœuvres which took place last summer off the coast of Cornwall, and a dictionary, also provisionally trilingual, of terms relating to the construction of barrages, in preparation under the auspices of the International Commission on Large Dams, and of which the first edition should appear in 1950.

By and large the method which seems to be followed is, first to delimit closely the field to be covered. Applied chemistry, for example, would represent a field quite sufficiently wide to be treated in a rational manner; it would be preferable to direct the efforts of the compilers solely to each of the 50 or 60 headings under which it could be divided. Several attempts in this sense have already been outlined, the last in date being a trilingual lexicon of terms relating to paints, pigments, and varnishes.

For the raw material recourse is had, with profit, to technical publications, manuals, and catalogues; one must aim at missing nothing of recent date and at the same time guarding against perpetuating obsolete terms, a defect which is not always avoided by authors of collections inspired too much by previous work.

The linguistic aspect of the problem would evidently necessitate international co-operation, for there are probably few men who possess thoroughly, in other languages than their own, the terminology of any branch whatever of technics. This work, extremely delicate, and which in certain cases cannot be expected to rise above the level of approximation, would require patient supervision on the part of several collaborators. Finally, in view of the complexity of the total work, it must be directed by a master hand charged with the task of co-ordinating and harmonising the work of several isolated specialists or teams of specialists.

The point whether a polyglot dictionary is preferable to a dictionary in two or several (few) languages has given rise to controversy. The latter type of work would seem, *à priori*, to have the advantage of being less voluminous and less costly, and it is rare that a translator is interested in many languages at once. On the other hand, it will be easier, in these conditions, to publish periodically, every two years, for example, supplements containing new terms.

While there is a fear of an exaggerated extension of the number of pages of these works, which must always remain 'handy,' one would advise their enrichment as far as possible with concrete examples of the use of the terms included. Before an enumeration of synonyms for a given word the reader is perplexed; he chooses a little by hazard and almost invariably badly.

The elaboration of a technical dictionary worthy of the name requires much time, money, and pains, and especially, on the part of the team which undertakes it, as much conscientiousness as devotion, joined with severe method in the division and control of the work. And it is the almost miraculous combination of all these factors which rendered such an enterprise so difficult to bring to a satisfactory conclusion.

NATURAL GAS STORAGE

The Chicago District Pipeline Company has been authorised to construct a $6 mill. plant near Chicago for the purpose of storing natural gas in liquid form during the warm weather months for use in the Chicago area during periods of peak winter demand. The plant, to be located in an isolated area of Will Country, Ill., will have a storage capacity of 400 mill. cu.ft. of gas and will contain facilities for liquefying about 4 mill. cu.ft. of gas daily and for regasification and return to the transmission system of 6 mill. cu.ft. per hour. The liquefaction process involves the separation and recovery of butane and propane, removal of nitrogen, and storage of gas in liquid form at a temperature below boiling point. The company has studied the problem of storing natural gas in liquid form since 1929 and has operated a pilot plant since 1934. In addition, studies have been made of other known pilot plants and commercial operations involving such storage. The company will offer the storage facilities to its customer companies under a rate schedule based on cost of service. Construction of the plant will be financed through a loan from Chicago District's parent company, the Peoples Gas Light and Coke Company.

THE ADMINISTRATIVE PLAN OF THE EASTERN GAS BOARD*

By J. H. DYDE, M.Sc., M.Inst.Gas E.,
Deputy Chairman, Eastern Gas Board

***EDITOR'S NOTE*:—The author gives an outline of the administrative plan as it is evolving in the area of the Eastern Gas Board. He emphasises that it is not presented as 'an example of how things should be done.' Rather is it a record of an early experiment, the first of a series which time and experience will perhaps amend in producing an effective organisation to fulfil the obligations and the duties laid upon the board by the Gas Act. The underlying aim, he states, is to provide the fullest scope for individual initiative and to permit that each shall make his or her contribution to the success and well-being of the gas industry in the area, and the area its contribution to the national industry.**

THE inspiring address given by Sir Edgar Sylvester to the Institution of Gas Engineers at its annual meeting this year will no doubt be still fresh in your minds, and you may recall two passages from it. The first runs thus: 'Nationalisation is a series of experiments in the organisation of a modern industry.' We are at present in an experimental stage, but being the last of the basic industries to come under public ownership we have an Act which has benefited from the previous experience of those which went before; we have an industry which has already featured great co-operative effort in many of its activities, and one which has had a singularly good record in its industrial relations. These circumstances should be conducive to advanced experimental treatment and yield fruitful results in the none too distant future.

The second passage from Sir Edgar's address, and one which struck me most forcibly, read as follows: 'A healthy and progressive organisation must have individual and local initiative in addition to a measure of central control. That some control is necessary is obvious, for without it there would be confusion and irresponsibility; initiative is equally essential, for unless there is initiative there is stagnation.' This was surely an invocation to those responsible for building the organisation of the 12 area boards. They must determine that delicate balance between the measure of central control and the degree of responsibility and initiative to be afforded to the individual at local level. It is a human problem beyond all else.

It has to be remembered at this stage of our new organisation that the chief officers of local undertakings have from their past experience been attuned to accept responsibility, and also that it is to the advantage of the board that their intimate knowledge of local affairs should be used to the full. You cannot preserve initiative by giving responsibility at local level and expect the right thing to be done, the right decision to be made, on all occasions; and I would rather see an official free to act on his own judgment than stultified by endless regulations emanating from headquarters as to how he should act on every occasion and fearful of the consequences of making a mistake. So much has already been written in critical vein of the tendency on the part of nationalised industries to build up top-heavy central organisations as to give the impression that such a tendency is inevitable. This is not so, however, for many large firms operating under private ownership have found that centralisation can be carried too far and have set about a reversal of their policy with beneficial results.

In our own industry the optimum degree of centralised control is obviously dependent on many widely varied factors. For instance, the size and characteristics of the area, the distribution of population and the gas producing centres that serve them, even the human resources available, determine, at any rate during the initial building of the organisation, the extent to which central control is desirable. While there are evident advantages from the aggregation and centralised control of production units, consumer service can never be centralised for it is too personal a service.

A compact metropolitan and urban area needs different treatment from scattered and rural areas. If it were possible to have before you the administrative organisation already set up by the 12 area boards you would undoubtedly find similarity in basic structure, but quite wide variation within that structural framework.

Characteristics of the Area

Let me give you a mental picture of the Eastern Area. It is heavily weighted in population to the south by urban areas covered by the former Tottenham and Barnet undertakings, and by Watford, St. Albans, and Luton, where great development took place between the wars and where extension on a considerable scale, including five new towns, is envisaged in the future.

After making a judicious division between these near metropolitan and urban districts with centres based on Watford and Tottenham, it has been possible to divide the remainder of the area into three sections, or divisions as we call them, based upon the population centres of Cambridge, Norwich, and Ipswich, and these five divisions comprise the area:—

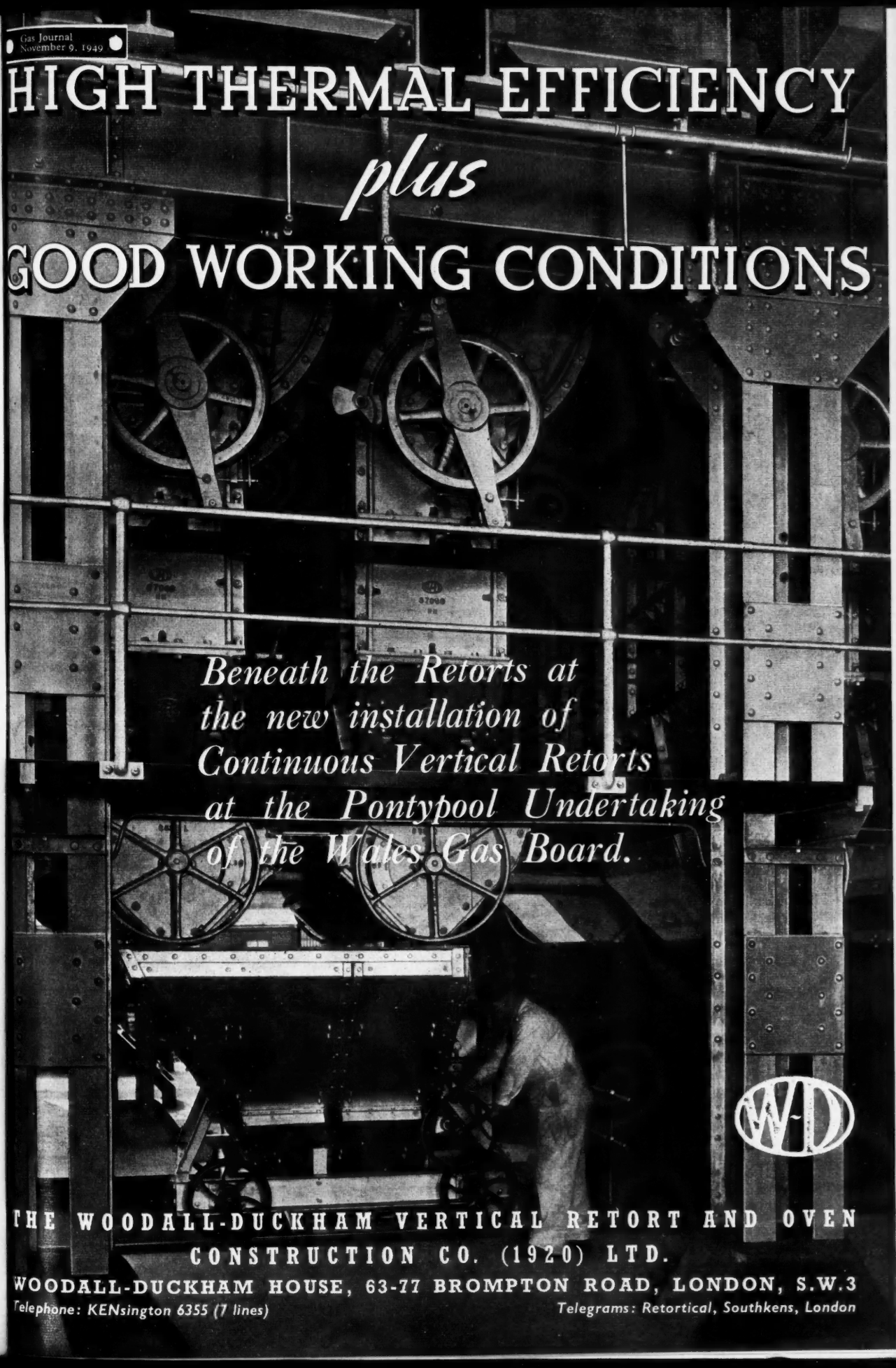
Division of Area.

Division.	Number of Undertakings.	Gas Output, 1947. mill. cu.ft.
Norwich	27	2,601
Ipswich	29	4,011
Cambridge ...	20	3,906
Watford	10	6,244
Tottenham ...	5	7,991
	91	24,753

The Watford and Tottenham divisions have much in common. They are influenced by the proximity of the metropolis and contain large dormitory areas for city workers. There has been a movement of industry, particularly of the secondary and lighter type, into these divisions. The new towns will, however, tend to stabilise the population so that it will seek its work, its living space, and its leisure locally. The other three divisions are quite different and comprise traditional centres dating from our earliest civilisation and set in predominantly agricultural surroundings with numbers of small works often widely scattered. These small works present a particular problem, and it is true to say that in many cases, without the assistance offered by the new organisation, their future would have been fraught with great difficulties and they may well have succumbed.

The number of vesting undertakings and the aggregated output as at 1947 are shown in the table above. It will be seen that no less than 27 former units go to produce the modest total of 2,600 mill. cu.ft. annual output of the Norwich division, of which Norwich itself contributes about 42%, while at the other

* Presidential Address to the Southern Association of Gas Engineers and Managers. October 25, 1949.



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extreme four undertakings, with one greatly predominating, have an output of 8,000 mill. cu.ft. and constitute the highly centralised organisation of the Tottenham division. It is considered, however, that these divisions are sufficiently large to provide for economical administration and sufficiently small for the divisional general manager and his staff to maintain close personal touch with the district units. It has been agreed that each division will represent a separate accounting unit. It is therefore responsible for the payment of salaries, wages, and general accounts. Each division will prepare its own profit and loss account, and a comprehensive costing system on a uniform basis has been introduced to achieve this end.

Divisional headquarters are responsible for the collection and collation of statistical returns of standardised form from group and district units included in the division and rendering them to central area headquarters. The broad terms of general policy are sent out from central headquarters to divisional managers who are responsible for their dissemination and implementation throughout the district offices of the division.

The Chain of Control

At this stage it is appropriate to deal with what, for want of a better term, I call the 'chain of control.' Control converges from central officers to divisional managers, and from divisional managers to group or district managers, as the case may be. There is no direct departmental control such as from area accountant to divisional accountant to local accountant or chief clerk. If such was the general practice it is considered that it would weaken the embracing authority of the divisional and district managers. This does not mean, however, that there is no close liaison between the area accountant and the divisional accountant, for they meet, as will be indicated later, in departmental committee. The important point is that the district or local manager, however small may be his area of control, is nevertheless the responsible person representing the gas industry in that area.

I would like to return for one moment to the central office organisation. The area secretary and area accountant are the two most responsible officers, and each has his own staff. That of the secretary includes a legal officer, and that of the accountant a statistician and internal auditor. These two senior officers attend the meetings of the board, though when dealing with special projects from the divisions the divisional managers are also in attendance.

It is the intention of the board to maintain the minimum of staff at area headquarters consistent with dealing with general policy and administrative co-ordination. Acting on this principle there is no chief engineer or commercial manager at area level, the operational functions of such being delegated to divisional level. There is, however, an area liaison engineer who, as his title implies, is the co-ordinating official on technical matters and who is advisory in function and reports to the deputy chairman who, in this case, is technical in capacity. Similarly, there is an industrial relations and welfare officer and, at the moment, an acting coal officer, at area level.

It might be asked how, under such a system, co-ordination is effected, and the general planning of development in production, distribution, and commercial policy formulated. The answer is that this is done on the Committee principle.

Area Committees

The Executive or Management Committee comprises the chairman, deputy chairman (being the two full-time members of the board), the area secretary and area accountant, and the five divisional managers, and it is charged with the job of recommending policy to the board. This Committee meets monthly at a convenient date before the monthly board. The Executive Committee is served by four specialised committees :—

(a) *Manufacture and Distribution Committee.*—This comprises the deputy chairman, area liaison engineer, divisional engineers, and a secretary. On this and the other three specialised committees the divisional managers are *ex officio*, but attend only if they wish to express a personal point of view on any item of the agenda. The function of this committee may be briefly expressed as dealing with the disposition and operation of manufacturing, storage, and transmission plant for the area as a whole.

(b) *Sales and Service Committee.*—This consists of a member of the board, the divisional sales and service managers, and an industrial specialist who represents the area on the national committee, also a secretary, and its terms of reference are to plan and co-ordinate commercial policy and consumer service in the area as a whole.

(c) *Finance and Statistics Committee.*—At the moment this comprises the area and divisional accountants. So far this committee, which has been very useful and very active, has dealt only with financial and accountancy matters, but it is hoped to include a statistician and member of the board versed in financial matters and extend its work on the statistical side as soon as a clearer picture is obtained of the type of information the Gas Council needs from the industry as a whole.

(d) *Labour Relations and Welfare Committee.*—Comprises three members of the board, the chairman and two part-time members, together with the divisional general managers, the industrial relations officer, and a secretary. The function of this committee is obvious from its name. Five members of this committee, together with five other officers from the divisions, who are in close contact with the workers, are to represent the employers' side on the Area Joint Industrial Council.

Divisional Special Expenditure Committees.—These are important committees insofar as they replace one of the main responsibilities of the former 91 boards of directors and local authority committees in dealing with the special items of expenditure put forward for approval by the managers of the various undertakings. This structure is significant insofar as it is one where the local manager or engineer comes into direct contact with members of the board and its chief officers. The membership of the committee comprises chairman and/or deputy chairman as chairman, the area secretary and area accountant, area liaison engineer, and the divisional manager concerned. Part-time members of the board with a residential interest in a particular division are also invited to attend these meetings and on occasion do so. There are also in attendance such divisional officers as the divisional general manager may consider necessary, and the projects put forward by district engineers and managers are presented by them in person.

The duty of the committee is to screen proposals as to need, technical soundness, and price, and, if satisfied on these counts, to recommend them for approval by the board. It is the intention as often as possible to hold these committees at divisional headquarters, and, indeed this has been done, for it gives an opportunity of meeting district officials on their own ground and of prior inspection of works and offices—in other words, of imparting the personal element to its dealings. The committee reports directly to the board so that there is little or no delay in proposals once initiated at local level being examined at divisional level and coming forward for sanction by the board.

There is a point, however, where a proposal may be referred to the area manufacture and distribution committee if there is doubt as to its soundness technically, or as to its conformity with the area plan of development. In the past few months the divisional expenditure committees have had to deal with an accumulation of arrears consequent upon work being held up either by the former boards pending nationalisation or by the Ministry pending consideration by the newly-formed area board. The work has consequently been very heavy, but it is expected that, as the divisional and area plans of development become more clearly defined, this will be eased. This system should result in development on sound lines with a steady trend towards increased all-round efficiency.

The special expenditure committee machinery employed is not new ; it originated, I believe, with the former Gas Light and Coke Company, and was adopted by the South Eastern Gas Corporation for dealing with the numerous proposals for expenditure emanating from the engineers and managers of the many companies under its control. The scheme worked well there, and I must say that it has been introduced smoothly into

the area organisation, and with great goodwill on the part of the divisional managers.

I would like now to give you a few impressions of some of the problems that have emerged in the course of the committee work to which I have just referred.

Arrears of Maintenance

There are large arrears of maintenance and renewals before production plant can be considered to be in a reasonable state of efficiency and repair. This is particularly the case with a number of the smaller undertakings where capital expenditure was cut to the bone to obviate financial loss and avoid further increase in the already high prices charged for gas. Such undertakings will necessarily have to be subsidised until they can be provided with a bulk supply or until new and modern plant is introduced or existing plant is reconditioned and stepped up to a higher standard of efficiency. The whole of this work constitutes a heavy financial burden.

Present Day Cost of Plant

I have obtained particulars from leading gas plant contractors of the increase in cost of similar plant units since 1938. Here they are :—

Contractor.	% Increase.
A	150-170
B	145
C	200
D	152
E	150

The average increase may be taken as 160%, so that the same plant may be expected to cost a little over two and a half times what it did pre-war. It is interesting to note that the *Board of Trade Journal* for May, 1949, said that industrial materials and manufactures showed an increase of 142% over the prices ruling in May, 1938. Knowing the special difficulties associated with gasworks sites, and the extraordinary amount of out-money and 'dirty' money involved, one can see that the figure quoted of 160% may be taken with confidence. One contractor did make the rather naive remark in answer to my queries that it was difficult to compare plant insofar as there had been a tendency for extravagant requests for accessories—particularly on the part of local authority undertakings. Another well-known firm stated that changed design incorporating the use of steel instead of cast-iron for such ancillaries as condensers, ammonia washers, and detarrers, has brought about a relative lowering in cost insofar as the increased cost with steel construction is only 103% whereas with cast-iron construction it would have been 132% over the cost in 1938.

It is fortunate that plants nowadays are being worked, on the whole, to a much higher load factor consequent upon the increase in consumption per consumer, and this has done much to offset the effect of the increased cost of renewals on the actual price to be charged for gas.

Where, however, a works has been allowed to sink into a position where total rebuilding is inevitable, the effect of new capital charges is quite shattering if applied to the gas costs of the distributing area it serves.

It is now possible, however, to iron out the effect of such charges so that they do not fall unfairly upon consumers. Such adjustments will take time to become effective and give rise to a general levelling of prices over wide areas. What is obviously desired, and will I am sure be carried out everywhere, is a careful programming of reconstruction and development work. This, too, is now possible to a degree which could not be attained with individual units all operating under independent management.

Large Scale Development

It is interesting here to record the estimated costs of extensions to works plant, district holders, trunk and estate mains to meet large scale development where four satellite towns are beginning to take shape in the Watford division of the Eastern area. These are extracted from the divisional development plan prepared by Mr. T. C. Battersby and Mr. W. A. Evetts. As closely as can be ascertained the consumption by 1954 will have increased by 11,300,000 therms, and the capital cost involved is estimated at £4,856,000. Taking interest on capital at 3%, redemption 1%, and 3.3% for depreciation of works plant, and 2½% for depreciation of mains and holders, the following itemised capital costs are obtained :—

			Pence per therm.
Production plant	at	7.3%	2.91
Trunk mains and district holders	at	6.5%	1.20
Estate mains	at	6.5%	1.21
		Total	5.32

The cost of production plant is usually stated in terms of cost per mill. cu.ft. per diem, and the figure actually quoted here in these terms is £180,000 per mill. per diem, and compares favourably with the figure of £185,000 per mill. per diem given by Mr. L. J. Clark in his presidential address to the London and Southern Juniors this year.

The cost of estate mains might appear to be rather low, but the divisor for consumption includes gas used for domestic, commercial, and industrial purposes. In this particular case, as would be anticipated, the trunk mains are laid to provide the full anticipated development of the towns although additional district holders will be required in later stages of development. The production and local distribution charges are built up as closely as practicable to meet demand as it develops. The total figure representative of capital charges—namely, 5.32d.—is a very high one and indicates the sort of problem that faces a board which has to deal with large scale development with prices as they exist today.

When you turn to the actual process of manufacture, you have to contend with coal at an increased cost of 140% and with wages at 95% above pre-war. After off-setting the effect of increased efficiency that may be expected from new plant, it is estimated that the cost of gas to the ordinary small consumer cannot be much less than 18d. a therm, or 70% to 80% above the pre-war level of prices in the districts concerned.

Coal and Type of Carbonising Plant

Of the 1,400,000 tons of coal carbonised in the Eastern area in 1948, 55% was treated in 22 continuous vertical retort plants, and 45% in 73 horizontal retort plants. Contract obligations taken over by the Eastern board for new carbonising plant will swing the balance still further in favour of the continuous system, and as distribution development continues it is largely the works with continuous plants that will provide the bulk supplies to the small horizontal stations which will cease manufacture. The tendency will therefore be to create a demand for the type of coal most suitable for vertical retorts, which is the type already in short supply. It would seem desirable that this tendency should either be arrested by selecting stations where the intermittent systems of carbonising may be used, or met by changes in the design of the continuous vertical retort to make it less selective in the type of coal it can carbonise efficiently, and thereby give a greater flexibility and freedom in the choice and consequent purchasing of coal.

Gasworks Building

As a reaction, perhaps, from the ugly and drab industrial buildings of the past, and to conform with present-day ideas of town planning, there has been a tendency to construct elaborate buildings of modernistic architectural design for carbonising and other plant. This is to be commended from the point of view of appearance and dust prevention, where the gasworks is situated near the residential or business quarter of a town, but I support the view expressed by Mr. E. O. Rose, the engineer of our Tottenham division, during the recent International Gas Conference in the discussion on the report entitled 'Choosing a Type of Retort,' that this is an unnecessary extravagance where the works is situated in an industrial area, or away from the town, and that in these circumstances an umbrella roof is all that is needed, particularly as the number of men required to operate modern verticals is com-

paratively small. There are in the Tottenham division of the Eastern area two intermittent plants with umbrella roof, and a large continuous vertical installation will be erected with the same type of roof. The saving in cost will be about 7½%, or £38,000 on a retort house of 8 mill. cu.ft. a day capacity. The operators say that they prefer the 'open' plants, as conditions are much better in hot weather, such as we experienced this summer, and they can wear Denham jackets and thick clothing in winter. Unless the plant is in an exposed position it is unlikely that the heat losses would be much greater than in a house.

Removal of Hydrogen Sulphide

The high capital cost, the large amount of controlled materials involved in construction, and the unpleasant nature of the labour associated with the operation of the orthodox system of removal of hydrogen sulphide by iron oxide in box containers have given a revival to pioneer efforts in wet purification.

The industry is awaiting with interest results of work now being done at Mirfield and Manchester, and I believe trial plants are going in elsewhere. These, I understand, all use iron oxide or hydroxide in suspension in alkaline solution as the absorbing medium, and revivification or re-oxidation is effected by forced aeration, when finely divided sulphur is precipitated and removed by filtration or sedimentation. Power costs, due to the high rate of circulation of the absorbing medium and the aeration process, are high. One fact emerges —namely, that the cost of removal increases steeply with the percentage extraction, and there may be good reason for utilising the system for partial removal and retaining existing oxide purifiers to take out the final quantities. If such is the case it would be welcomed by many works who are now out-growing their existing purifying plant and particularly where space-saving is a consideration. In the meantime, it has been necessary for us to proceed in new works development with the dry oxide method, and an order has recently been placed for an 8 mill. cu.ft. per diem unit of tower purifiers complete with handling plant and capable of extension to a capacity of 12 mill. cu.ft. a day.

Comparison of capital cost with an installation of overhead concrete boxes with elevators and transporter oxide handling system completed a year ago is given below :—

	£	Capacity mill. cu.ft. per diem.	Cost per mill. cu.ft. per diem. £
(1) Overhead concrete boxes, 4 streams of 5 boxes each and handling plant with metering on each stream—30 ft. by 30 ft. by 7 ft. ...	133,500	8	16,600
(2) Tower purifiers—5 operating 1 stocking tower. Goliath type crane disintegrating and filling plant and purging plant ...	161,040	8	20,100
(3) Ditto, extension to 12 mill. cu.ft. per diem	191,740	12	16,000

The decision to accept the tower type on the latest order was influenced, first, by saving in space, and secondly, by the difficulty in securing suitable labour in that particular locality for box purifier work. The tower system, with its increased mechanism, should enable the work to be spread more evenly throughout the year and to be carried out by fewer men under conditions of greater comfort.

If the Eastern area is any barometer to conditions in the industry as a whole, the problem associated with the disposal of liquid effluent is one of the most difficult and urgent matters facing us today.

In a great many cases the solution is to discharge these effluents into the sewers, and industry has powers under the Public Health (Drainage of Trade Premises) Act, 1937, to do so, provided that the effluent complies with certain conditions. Local authorities, however, are often reluctant to accept the effluent because their sewage works are old and overloaded. They are, in fact, facing very much the same problems as we are in rebuilding, re-grouping, and re-siting of plant to meet the greatly increased volume of sewage often associated with a higher degree of toxicity which has to be treated.

There is need during this transitional period of adjustment for the greatest goodwill on both sides, for the sewage authorities and we ourselves severally have a public duty to perform. It will call for the closest co-operation in the future between gas and sewage engineers and chemists so that they may appreciate one another's problems, and particularly is this the case when planning and finding sites for new gasworks.

The Liquor Effluents Committee of the Institution of Gas Engineers has therefore quite a considerable task before it and might with advantage be reinforced to include a representative from each area board so that co-ordination nationally on technical problems could be secured.

Work of Effluents Committee

In the Eastern area we have set up an effluents committee to deal with the many difficulties that have arisen, and two chemists, one of whom already serves on the Institution Committee, operate from two separate laboratory centres and cover the whole area divided roughly as between the various catchment boards. For the time being there is little that can be done in cases where the local authority is unable to take the effluents or where a connection to a sewer is impracticable, but to transport the crude liquor to works where it can be distilled and where existing facilities for disposal of the waste liquid are available. In several small works the first consideration is to increase the worked-up strength of the liquor, for considerable dilution has been practised in the vain hope that it would make it acceptable for discharge to water courses. A considerable saving in transport costs will result from the working up of the liquor to a proper concentration. With efficiently organised transport this cost need not be high. For instance, Mr. W. A. Evetts gives a figure of 0.082d. a therm for the transport of crude liquor from Hemel Hempstead—a works producing annually 500 mill. cu.ft. of gas (all coal gas)—to Watford works.

In connection with the building of an entirely new works, a site is available which is in all respects desirable except in that of liquor disposal, and the matter is being held in abeyance pending the results of such pioneer work as is now going on at Tingley. Briefly, the steps in the process are, first, to wash out the monohydric phenols with benzole, then distil the liquor for ammonia recovery which, incidentally, can be arranged to eliminate certain of the undesirable sulphur constituents, next to evaporate the effluent from the still to 10% of its bulk, and extract the polyhydric phenols with butyl acetate (a solvent brought to light by a British Intelligence Committee visiting Germany, and known there as phenolsolven). The residual solution on evaporation gives a crude ammonia chloride. The monohydric phenols, the concentrated ammonia, and the crude ammonia chloride have a certain market value. The small quantity of polyhydric phenols and other analogous bodies with a very high oxygen absorption content appear to have little value, but its transport to the sea or its destruction by chemical oxidation should not be a difficult matter. The work is extremely interesting, and the outcome of it and of other chemical engineering research is eagerly awaited. Certainly, it would be a great boon to the industry if some simple method could be evolved of extracting monohydric phenols and of destruction of the remaining oxygen absorbing bodies by oxidation or other means to produce a more readily acceptable effluent, on a scale that would meet the requirements of the medium-sized undertaking.

UTILISATION OF REFINERY GAS*

By R. WALKER, M.Inst.Gas E., M.I.Chem.E., Chief Engineer,
and
H. C. APPLEBEE, A.R.I.C. Chief Chemist, Manchester Undertaking

Mr. Walker received his early training in Leeds and Birmingham. He served in the Middle East in the first world war. Later as manager he brought the new Partington works into operation. He assumed duty as Chief Engineer at Manchester on the night of the 'blitz' in 1940 when three of the works were damaged and on fire. He has been responsible for directing research which led to the invention and successful development of the 'Manchester' liquid purification process.

Mr. Applebee first entered the gas industry as Assistant Chemist at the Gas Light and Coke Company's tar and products works, Beckton, in 1905. He was afterwards Works Chemist to Major & Co., Ltd., Tar Distillers. Hull; Works Chemist, Clayton Aniline Co., Manchester; Works Chemist, Manchester Gas Department, Bradford Road; and has been Chief Chemist at Manchester since 1930. He was president of the Manchester Juniors in 1929-30.

IN common with many other gas undertakings, during the winters of 1941-4 the Manchester Gas Department found itself desperately short of gas. Even after bringing into operation plant which had not worked for many years and was indeed considered redundant, the shortage remained acute.

During this period it became known that a large oil refinery was to be established on a site adjoining the Partington Works of the Manchester Undertaking. The Catarole process was to be operated and substantial volumes of tail gas would be available. Negotiations were opened with the Manchester Oil Refiners, Ltd., and their associated companies, and eventually an agreement was drawn up for the purchase of tail gas. Accordingly, schemes for the utilisation of the refinery gas were prepared.

In the first place a proposal was considered to take in the rich gas at Stretford direct to the 36 in. trunk main leaving the Partington Works, but this was rejected owing to the difficulty of blending satisfactorily in the relatively short time (half hour) before distribution.

It was regarded therefore as essential that a good blend should be secured before the inlet to the 5 mill. cu.ft. works holder, and that all the rich gas should first be blended with blue water gas before mixture with the main coal gas stream. This will be the finally adopted procedure, but as the water gas plant is only now nearing completion, preliminary blending has been done with producer gas.

The following points from the general agreement with the supplier of refinery gas are of interest in giving conditions on which supply is regarded as acceptable :—

> The gross calorific value of the gas, after saturation with water vapour, shall be continuously recorded on an approved recording calorimeter as B.Th.U. per cu.ft. of gas at a pressure of 30 in. mercury absolute and a temperature of 60° F., saturated with water vapour. A verifying test of the calorific value according to the principles applied by the Gas Referees or their successors shall be carried out at least once per 24 hours and the reading of the calorific value as recorded by the recording calorimeter corrected according to this test which is to determine the gross calorific value of the gas as B.Th.U. per cu.ft. at 30 in. mercury absolute and 60° F. saturated.
>
> The average over 24 hours of the calorific value of the gas as recorded by the recording calorimeter and agreed according to the daily verifying test shall be deemed the calorific value supplied on that day. Petrochemicals will notify the undertaking of any variation in the calorific value of the gas supplied from a datum value of 890 B.Th.U. in accordance with the following schedule :—

Increases	Increases exceeding 50 B.Th.U. Minimum notice—2 hours.	
Decreases		Minimum Notice
Decreases	up to 25 B.Th.U.	Nil
,,	from 25 to 50 B.Th.U.	2 hours
,,	,, 50 to 75 B.Th.U.	4 hours
,,	,, 75 to 100 B.Th.U.	24 hours
,,	Over 100 B.Th.U.	1 month

Should either party desire alteration in the datum calorific value of gas supplied and purchased, they shall request the other party to agree to such alteration, such agreement not to be unreasonably withheld.

The maximum inerts is not to exceed 5% with oxygen not exceeding 0.6%.

Gas to be free from H_2S in accordance with the Gas Regulation Act.

The gas is to be free from tar and oil according to standard gasworks practice when tested by a mutually agreed method.

The naphthalene is not to exceed 0.1 grains per 100 cu.ft. at 30 in. mercury and 60° F. saturated, when tested by a mutually agreed method.

The gas is to be delivered at the works of the undertaking at Partington at not less than 40 in. W.G. pressure.

Preliminary Schemes

As originally conceived, the intention was to continue the usual Partington practice of diluting the coal gas with producer gas, but to erect new carburetted water gas plant, the water gas being used for the dilution of the refinery gas, and any surplus being carburetted so as to maintain an overall calorific value of 450 B.Th.U. per cu.ft.

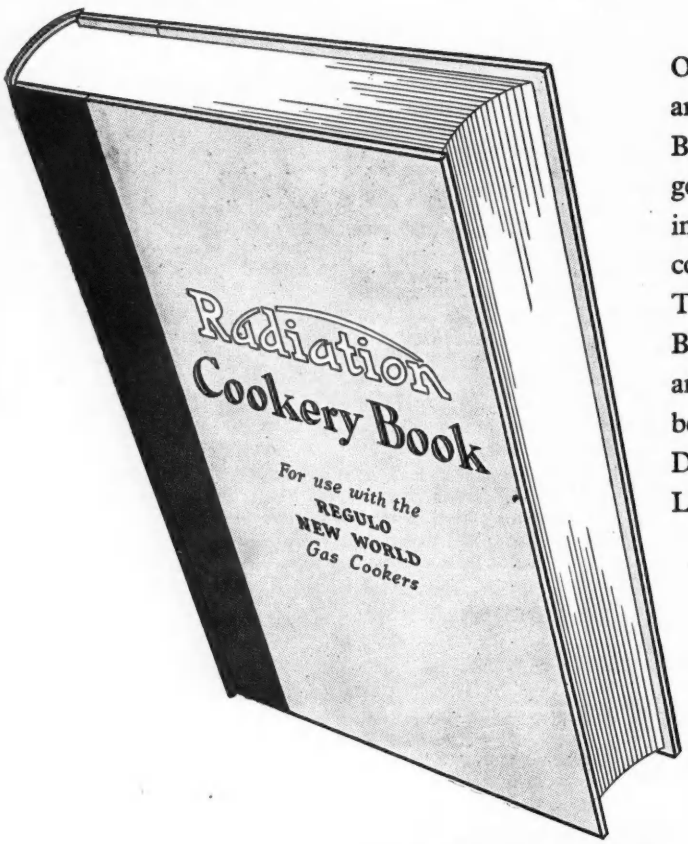
It was not possible to make practical experiments as to the effects of such mixtures on the combustion characteristics of the town gas, since no refinery gas or water gas was available at that time, so calculations were made for a number of possible—although hypothetical—mixtures of coal gas, blue water gas, producer gas, and refinery gas. It was assumed that coal gas of lower calorific value than normal would be produced by the extra steaming of the vertical retorts, and it was understood that the calorific value of the refinery gas would be 1,200 B.Th.U. per cu.ft.

The results of some of these calculations are given in Table I, and it will be seen that there appeared to be no reason to anticipate any difficulty in the utilisation of any such mixtures.

Later it was learned that the refinery gas would be supplied in three successive periods as the plant at the refinery developed. It was anticipated that each of the first two stages would last for about three to six months, and that the calorific

* Paper presented to the Autumn Meeting of the Manchester District Association of Gas Engineers, October 28, 1949.

Good Cooking



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value and specific gravity at each stage would be approximately as follows :—

1st Stage—	Calorific	Value	(Gross)	1,200	Sp.	G.	0.67
2nd „ —	„	„	„	1,000	„	„	0.57
3rd „ —	„	„	„	890	„	„	0.47

The fall in calorific value and in specific gravity follows the successive removal from the refinery gas of the ethylene, ethane, and other hydrocarbons, the gas at the final stage consisting of hydrogen and methane in the proportion of approximately 1 to 4.7.

The quantity available at the final stage would be approximately 600,000 cu.ft. per day.

Among other matters which arose at this stage was the question of the A.T.B. number of any new mixture of gases for town supply purpose. Although the A.T.B. number of the town gas distributed from each of the various works of the undertaking had been determined for some time past, it was obviously impossible to make these tests for the hypothetical mixtures which were considered. But as the other characteristics showed no marked change it was assumed that the A.T.B. number also would not be greatly affected.

In view of the high calorific value of the gas to be received it became necessary to consider the question of calorimeters. Without modification, none of the standard calorimeters was likely to be suitable, and those recording calorimeters which required checking by an independent instrument suffered from the further disadvantage that even the standard Boys calorimeter would not burn the refinery gas satisfactorily. Nor did such modifications of the standard Boys calorimeters as we were able to try give satisfactory results.

Eventually a Fairweather recording calorimeter with certain modifications was ordered. The burner was to be of a special type to ensure complete combustion, the rate of burning was reduced in order to bring the heat input into line with that necessary for the modified Boys calorimeter which is incorporated in the instrument. In order to avoid the use of specially printed charts, and also to give a satisfactory spacing, resistances were introduced into the electrical recording circuit which would have the effect of bringing the record within the range of the normal chart. Thus the same chart could be used for each of the three stages, all that is necessary being to alter the connections of the electrical resistance thermometers (without stopping the instrument).

Present Conditions

Last autumn it was found that supplies of refinery gas would be available early in the new year. Unfortunately, there was no hope of completing the carburetted water gas plant until much later in the year so that no blue water gas would be available for dilution purposes.

There were, however, two Power Gas producers each with a capacity of 120,000 cu.ft./hr. awaiting erection, though for other purposes. The erection was hurried on and at the same time three small purifiers (which had been supplied with the producers) were also set up with the intention of purifying the producer gas before mixing with the refinery gas. These purifiers subsequently proved inadequate for the purification of the full quantity of producer gas needed, and a large part of the producer gas has necessarily been added to and purified with the crude coal gas.

At the same time, it was learned that the calorific value of the refinery gas would be much higher than had been anticipated and that the specific gravity would also be much higher. The calorific value of the refinery gas has in fact been about 1,450 to 1,500 B.Th.U. cu.ft. and the specific gravity about 0.87. This meant that larger volumes of producer gas would be required to dilute and since the specific gravity of the producer gas is itself very high, a considerable increase in the specific gravity of the mixed gases was inevitable and the possibility of difficulties in utilisation was foreseen.

TABLE I

Reference	A		B		C		D		E		F	
	% by vol.	C.V.	% by vol.	C.V.	% by vol.	C.V.	% by vol.	C.V.	% by vol.	C.V.	% by vol.	C.V.
Coal gas	92.7	477	55.35	432	61.2	441	70.25	441	57.8	441	39.7	441
Producer gas	7.3	130			4.8	130	20.3	130	7.8	130	10.7	130
B.W. gas			35.7	290	25.75	290			25.1	290	36.7	290
Refinery gas			8.95	1,200	8.25	1,200	9.45	1,200	9.3	1,200	12.9	1,200
Gas analysis :												
CO_2, % by vol. ...	5.0		3.5		3.6		3.5		3.6		3.6	
O_2, % by vol. ...	0.5		0.2		0.2		0.3		0.2		0.2	
CnHm, % by vol. ...	2.5		1.2		1.2		1.4		1.2		0.8	
CO, % by vol. ...	13.5		24.2		21.6		16.9		21.6		24.4	
CH_4, &c., % by vol.	20.4		19.0		20.1		22.9		20.5		20.5	
H_2, % by vol. ...	46.2		47.5		46.2		40.2		44.4		40.9	
N_2, % by vol. ...	11.9		4.4		7.1		14.8		8.5		9.6	
Calorific value, gross B.Th.U./cu.ft. ...	451.5		450		450		450		450		450	
Specific gravity (Air=1)	0.509		0.503		0.510		0.555		0.5265		0.563	
Air required for combustion of 1 cu.ft. gas, cu.ft.	3.876		3.993		3.991		4.076		4.022		4.005	
Wobbe index	633		634		630		604		620		600	
'M' index	3,439		3,572		3,521		3,304		3,436		3,201	
Ratio : CnHm+CH4/CO+H2 ...	0.3835		0.282		0.314		0.425		0.329		0.326	
Flame temperature, °C.	2,130		2,105		2,100		2,050		2,085		2,085	
Flame speed, ft./sec. ...	6.8		6.9		6.7		6.1		6.6		6.3	

Note : Reference A, normal Partington town supply.

The recording calorimeter, even in the highest range for which it was designed, would not successfully burn the very high calorific value gas which was in fact received, but further modifications of the calorimeter, though only of a temporary nature, have become necessary. The gas rate has been lowered, a further external resistance has been added to the electrical circuit, and the instrument is now functioning with reasonable satisfaction and accuracy.

A further complication arose from the fact that the gas to be received initially would contain small percentages of styrene, indene, cyclo-pentadiene, &c., as well as some benzene, toluene, &c., and possibly a little naphthalene. The first three are capable of gum formation and so must be considered undesirable, while the benzene and toluene would pay for recovery, and naphthalene was also undesirable. Consequently, it was arranged that the refinery gas, after mixing with the producer gas, should be oil washed. While this might not remove the objectionable constituents entirely, it was hoped that their concentration might be so reduced as to prevent any serious trouble. Fortunately, this has proved to be the case and no special difficulty due to gum formation has been experienced.

The first refinery was was received on January 28, 1949, and although at first both volume and calorific value were erratic, dilution has continued with reasonable constancy both in calorific value and volume almost without a break.

A number of analyses of the refinery gas has been supplied

by Petrochemicals, Ltd., and their average is given below :—

by volume	%
H_2	9.1
CO	0.2
CH_4	46.7
C_2H_4	18.7
C_2H_6	11.4
C_3H_6	2.0
C_4H_8	2.0
C_4H_{10}	0.3
	99.6

Spec. Gravity (Calc.) 0.777
Cal. Val. (Gross) B.Th.U./cu.ft. 1,324

It should be noted that 0.4% by volume of the gas is unaccounted for in the analysis. The deficiency would appear to be due to benzenes, C_5s and other hydrocarbons undetermined. Consequently, both the specific gravity and the calorific value are lower than those of the gas actually received.

Between Jan. 28 and May 26, conditions were fairly stable and the quantities of refinery gas, producer gas and coal gas were as given in Table II. Further details as to specific gravity, Wobbe number, A.T.B. number, &c., for this period are given in Table III and an average of the gas analyses, &c., covering the period is given in Table IV.

TABLE II

Date 1949	Coal gas %	Producer gas %	Refinery gas %
Feb. 1-28	76.9	17.6	5.5
Mar. 1-31	73.5	20.1	6.4
Apr. 1-30	64.5	26.9	8.6
May 1-26	61.0	29.8	9.2

During the period there was no significant increase in the number of complaints received, and there was no indication that any particular difficulty was being experienced in utilisation in spite of the obvious differences in the quality of the gas.

On May 26 part of the horizontal retort house was shut down. This had the immediate effect of raising the proportions of refinery and producer gases in the mixture with a corresponding rise in the specific gravity and fall in the Wobbe number as indicated in the Table No. V. Complaints then became more numerous. Generally speaking, there was little or no difficulty with aerated burners of the bunsen type, but with non-aerated burners or neat gas jets the flame tended to lift or even to float and in some cases to go out altogether.

Thus it was found that if the specific gravity of the gas exceeded 0.67 or 0.68, considerable difficulty was caused and steps were taken to keep the specific gravity as far as possible below the limiting value of 0.67. It is not suggested that specific gravity is in itself the only factor involved, but in so far as it is one indication of the constitution of the gas mixture, the specific gravity forms a useful criterion.

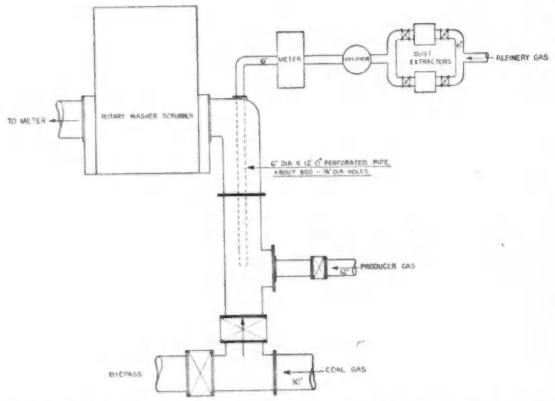

Fig. 1.—Diagram showing temporary gas mixing arrangement.

On July 11 the proportion of horizontal gas was increased and the situation was somewhat eased, although it is still felt that the difficulty will not be entirely overcome until either the proportion of coal gas is decidedly increased or the water gas plant is in operation. Results of some tests made during this period, &c., are given in Table IV.

No special arrangements either for proportioning or mixing have been installed beyond a perforated pipe inserted in the main by which the refinery gas is introduced into the diluting producer gas and coal gas (Fig. 1.)

The matter of proportioning and mixing has been discussed at length and many suggestions have been made, but since no difficulty has been experienced and there has been no evidence of stratification at any point, the practice of regulating the admission of producer gas manually has been retained. In any case the present arrangement is only temporary and an elaborate system of proportioning and mixing is quite unnecessary.

Bearing in mind the ultimate intention of diluting the refinery gas with blue water gas, the discussions on the point of automatic proportioning have mainly been limited to mixture of these two gases.

The usual proportioning schemes assume that one of the constituents will be constant. Since we are under contract to take refinery gas in quantities which may vary up to 50% in excess of the normal amount in any one day or 100% in excess in any one hour, while the calorific value may also vary within certain limits, it is evident that automatic control could not be based on the refinery gas streams.

The output of blue water gas would be roughly constant, and must be more than sufficient for the purpose so as to allow for variations in the refinery gas stream. Hence, if automatic control were based on the blue water gas stream, it would be necessary to deal with the surplus which must be raised to 450 B.Th.U. in order to maintain the declared calorific value. This could only be done by carburetting, but it would not be practicable to carburet only a portion of the blue water gas, and so the whole make of water gas must be carburetted to such a degree as to give a final calorific value to 450 B.Th.U. to the mixture. Automatic control on the water gas stream would thus become impracticable and the necessary control must be operated on the oil used for carburetting.

The following examples illustrate the point :—

600,000 cu.ft. of refinery gas at 890 B.Th.U. per cu.ft., plus
1,650,000 „ of blue water gas at 290 B.Th.U. cu.ft. gives
2,250,000 „ of mixed gas at 450 B.Th.U. per cu.ft.

If the water gas production is 3 mill. cu.ft. there will be a surplus of 1,350,000, which must be raised to 450 B.Th.U. Then 1,350,000 cu.ft. at 450 B.Th.U. plus

1,650,000 „ „ 290 „ gives
3,000,000 „ „ 362 „

That is, the total production of water gas must be carburetted to give a calorific value of 362 B.Th.U., so that :

3,000,000 cu.ft. of carburetted water gas at 362 B.Th.U. per cu.ft., plus
600,000 cu.ft. of refinery gas at 890 B.Th.U. per cu.ft. gives
3,600,000 cu.ft. of mixed gases at 450 B.Th.U. per cu.ft.

Other considerations arise, such as the suitability of available apparatus, which affect the practicability of schemes for proportioning the various gases ; and so for the time being at least, we propose to rely on the normal control of the carburetted water gas plant. So far as the mixing of the gases is concerned our present experience has been such as to lead us to anticipate no difficulty when the final scheme is in operation and hence we have made no special arrangement for the purpose.

Unfortunately, even at the present date, the water gas plant is not in operation and thus we are unable to give any information on this phase. Comparisons with the results obtained to date (with producer gas as the diluent) would have been of great interest, but must of necessity be deferred. Nevertheless,

the experience of the past few months has been of great interest from the point of view of the utilisation of such an unusual mixture, and in the following notes some comments are made on the bearing of each of the characteristics on that utilisation.

was attached a pressure gauge. The procedure was to light each burner in turn and steadily to raise the pressure until the light was extinguished. Prior to extinction, the flames, particularly in the case of the Partington gas, became distorted and the tendency to lift became evident well before the flame was

TABLE III

Date 1949	Calorific value			Specific gravity			Wobbe No.			A.T.B. No.		
	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
Feb. 1-28	461	485	445	0.616	0.659	0.572	589	638	574	33.5	39.2	31.5
Mar. 1-31	450	476	437	0.614	0.670	0.523	572	628	545	32.7	36.5	30.5
Apr. 1-30	455	485	433	0.649	0.667	0.626	563	575	543	32.3	35.0	30.0
May 1-26	454	475	435	0.636	0.657	0.624	568	597	547	31.8	34.4	29.8

TABLE IV.—ANALYSIS OF TOWN SUPPLY WITH REFINERY GAS.

Reference	A	B	C	D	E	F	G	H
Date, 1949	February	March	April	May	June	July 1-10	July 11-31	August
Gas analysis :								
CO_2, % by vol. ...	5.2	5.6	5.3	5.5	6.0	6.1	5.2	5.8
O_2, % by vol. ...	0.5	0.5	0.3	0.4	0.5	0.4	0.7	0.4
CnHm, % by vol. ...	3.7	3.9	4.0	3.9	5.2	5.0	5.4	5.3
CO, % by vol. ...	13.3	13.2	13.8	13.6	16.6	14.4	16.5	14.9
CH_4, &c., % by vol.	22.0	20.6	20.5	21.2	19.0	20.0	19.1	19.8
H_2, % by vol. ...	36.1	36.2	36.0	34.2	28.0	28.05	26.4	27.4
N_2, % by vol. ...	19.2	20.0	20.1	21.2	24.7	26.05	26.7	26.4
Calorific value, gross B.Th.U./cu.ft. ...	461	450	455	454	454	449	450	450
Specific gravity (Air = 1)	0.616	0.614	0.649	0.636	0.681	0.673	0.692	0.684
Air required for combustion of 1 cu.ft. of gas, cu.ft.	4,041	3.950	3.981	3.974	3.962	3.965	3.965	4.010
Wobbe index	587	574	552	569	550	547	541	544
'M' index	3,024	2,895	2,791	2,837	2,642	2,645	2,578	2,638
Ratio : CnHm+CH4/ CO+H2	0.520	0.496	0.492	0.525	0.543	0.589	0.571	0.593
Flame temperature, °C.	2,100	2,100	2,110	2,100	2,090	2,075	2,070	2,060
Flame speed, ft/sec. ...	6.0	6.0	6.0	5.8	5.5	5.4	5.3	5.4

TABLE V

Date 1949	Calorific value			Specific gravity			Wobbe No.			A.T.B. No.		
	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
June 1-30	454	472	438	0.681	0.710	0.663	550	567	529	30.1	31.7	29.0
July 1-10	449	456	438	0.673	0.702	0.653	547	558	534	29.7	30.6	28.4
July 11-31	450	460	441	0.692	0.706	0.648	541	600	535	31.4	31.9	28.9
Aug. 1-31	450	470	446	0.684	0.731	0.659	544	568	527	31.3	33.0	29.9

TABLE VI

Gas	Calorific value, B.Th.U.	Specific gravity	Wobbe No.	A.T.B. No.	Pressure for blow-out, in. w.g.							
					No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Partington	451	0.676	549	31.2	6.7	3.5	5.5	4.7	5.7	5.3	5.7	4.8
Partington	454	0.669	555	31.5	7.0	3.6	5.65	4.9	6.2	5.7	6.8	4.9
Partington	444	0.6925	534	30.5	6.9	3.4	5.25	4.6	5.6	5.3	6.6	4.4
Partington	452	0.659	557	33.9	6.9	3.6	5.7	5.1	6.1	6.1	6.8	5.4
Bradford Road	452	0.532	620	31.2	7.2	6.9	Over 7.0	Over 7.0	Over 7.0	Over 7.0	Over 7.2	Over 7.2
Bradford Road	455	0.539	620	33.1	7.1	7.1	Over 7.1	Over 7.2	Over 7.3	Over 7.3	Over 7.4	Over 7.4

Note : In the case of Bradford Road, the jets had not usually blown out at the maximum pressure available.

Combustion Characteristics

It will be seen that no particular difficulty was experienced until the specific gravity reached, say, 0.68. The heat output from a given orifice will, of course, be decreased by a rise in specific gravity, and it may be thought that this difficulty could be corrected by raising the pressure. But it was quickly found that in the case of non-aerated burners, raising the pressure aggravated the difficulty, causing the flame to lift from the burners and ultimately blow off altogether or to be extinguished, though little, if any, effect was observed with bunsen type flames. In fact, it became necessary to lower the pressure in many cases in order to keep the flame on the burners.

The figures given in Table VI illustrate the difference in behaviour of the normal gas (from Bradford Road) and the Partington gas. The apparatus used in these tests consisted simply of a series of jets, mounted on a straight tube to which extinguished. In most cases the burner became very noisy as the pressure was raised. The results have not been entirely consistent, but comparison of the two sets of figures will indicate the difference in behaviour of the two types of gases.

As has already been said, it is not suggested that the specific gravity *per se* is entirely responsible for the phenomena. It is thought rather that the lower hydrogen content of the Partington mixture, which is shown by the analyses, is the dominating factor.

Flame speeds for the mixtures concerned have been calculated, according to the method of Payman and Wheeler, and using the figures in a comparative sense only, the lowering of flame speed is evident.

The air required for theoretical combustion does not vary very widely and it is thought that such variation as exists would not account for the differences in behaviour. It may be

recalled that with bunsen type burners there has been little or no difficulty.

The Wobbe Index inevitably falls with a rise in specific gravity (the calorific value being constant). It has been found that increasing the calorific value of the gas does help in correcting the troubles, and we are inclined to think that the Wobbe number is the readiest criterion of the behaviour of the gases. The American 'M' index, which involves the 'air required for combustion,' also shows a marked decline in comparison with the former figures. But as the 'air required' varies so little it does not seem worth while in this case to make the further calculations involved.

The ratio of hydrocarbons ($C_nH_m+CH_4$) to hydrogen plus carbon monoxide (H_2 + CO) has risen—again owing to the hydrogen deficiency. The calculated 'flame temperatures' have altered very little, and hence where maximum temperature is of importance, the change in the constitution of the Partington gas should not be significant.

The A.T.B. numbers of the gas distributed from Bradford Road as well as from Partington had been determined for a long period before any refinery gas was received. It was thought that the A.T.B. number might give good indication of any change following the introduction of the refinery gas. This expectation has not, however, been fulfilled as the figures given in Tables III or V will show.

In general, while there has been some fall in the A.T.B. number of the Partington gas as compared with the figures obtained before refinery gas was introduced, the fall has not been particularly marked, and indeed the A.T.B. numbers have often been as high as, and on occasion higher, than some of those previously obtained. Even now the Partington figure is usually higher than that for Bradford Road where no refinery gas can be used.

Mr. J. W. Wood, Research Chemist to the Gas Research Board, made some tests at Partington in April with mixtures of refinery gas and producer gas, and the following passage is quoted from his report :—

> 'The A.T.B. number for a 450 B.Th.U. producer gas—refinery gas mixture is about 28.3.
>
> According to the data of G.R.B.34, the average A.T.B. number of the gas at Partington before the supply of refinery gas was commenced was about 32.6. No great change in A.T.B. number would therefore be expected on mixing these two gases. For the proportions in which Partington is at present receiving refinery gas (about 10% by volume of the total send-out), the drop in A.T.B. number should not exceed 1-2 A.T.B. units, which, I believe, agrees with experience. The effect of adding 40% of 450 B.Th.U. producer gas—refinery gas mixture to the gas would be to raise the specific gravity from 0.50 to 0.65.
>
> It is clear that the proportion of producer gas—refinery gas mixture could be appreciably increased without difficulty and that a slightly richer mixture could be supplied to compensate for the higher specific gravity of the producer gas—refinery gas mixture.'

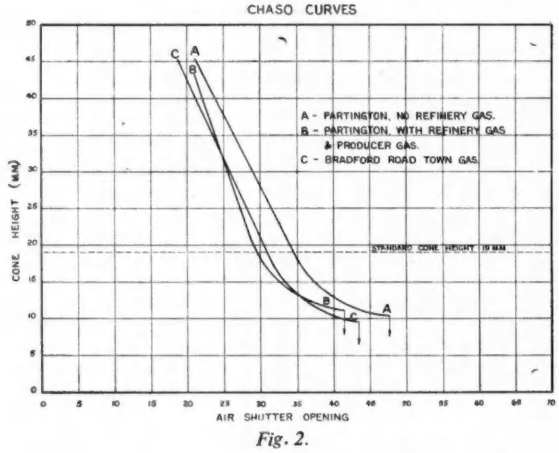
CHASO CURVES
A - PARTINGTON, NO REFINERY GAS.
B - PARTINGTON, WITH REFINERY GAS & PRODUCER GAS.
C - BRADFORD ROAD TOWN GAS.
STANDARD CONE HEIGHT 19 MM.
CONE HEIGHT (MM)
AIR SHUTTER OPENING

Fig. 2.

While it is true that the proportion of producer gas—refinery gas mixture could be increased without seriously affecting the A.T.B. number, it has been found that other combustion characteristics are very seriously affected. It is somewhat disappointing that the A.T.B. number should not have proved more useful in this particular connection, although many will feel that it forms a useful criterion for more normal gases.

A number of Chaso curves have been plotted and Fig. 2 shows three representative examples. Here again no very clear conclusions can be drawn and the Chaso curve does not appear to be of great service in these particular conditions. The comparative failure of the A.T.B. apparatus to provide serviceable information may perhaps be related to the fact that so little trouble has been experienced with burners of the bunsen type.

Future Arrangements

It is intended, as has been indicated, that as soon as the water gas plant is available, blue water gas will become the diluent. Later the calorific value of the refinery gas, and its specific gravity, will fall.

It is not possible to give any actual analyses of the gas mixture as it will be in these circumstances, but in Table VII an attempt has been made to indicate the probable analysis, combustion properties, &c., of the mixture. (It is assumed that the volume of refinery gas will be 600,000 cu.ft. per day at 890 B.Th.U. per cu.ft.)

TABLE VII

Coal gas, % by vol.	84.9	78.1
Producer gas, % by vol.	8.75	—
B.W. gas, % by vol.	—	16.1
Refinery gas, % by vol.	6.35	5.8
Gas analysis :		
CO_2	4.7	4.7
O_2	0.6	0.5
CnHm	2.0	1.9
CO	12.7	16.0
CH_4, &c.	24.3	22.4
H_2	38.5	42.4
N_2	17.2	12.1
Calorific value gross B.Th.U./cu.ft.	450	452
Specific gravity	0.545	0.517
Air required for combustion of 1 cu.ft., cu.ft.	3.933	3.917
Wobbe index	609	628
'M' index	3,247	3,424
Ratio Cn.Hm. + CH_4/CO + H_2	0.514	0.416
Flame temperature, °C.	2,100	2,120
Flame speed, ft./sec.	5.9	6.3

These figures indicate no reason to anticipate in the future the difficulties which have arisen in the past. Even if more refinery gas becomes available, the use of water gas rather than producer gas should enable us to cope with it and given satisfactory financial terms, the utilisation of refinery gas should provide a very satisfactory addition to the resources of the undertaking and the general needs of the area.

The authors have presented this as a preliminary account of experience with the problems involved in linkage of coal gas and refinery gas practice and feel the data given will be of general interest ; and as there are now other areas in which similar circumstances are likely to arise it is thought the information will be of some service.

The National Miners' Welfare Joint Council announces that new pithead baths were started during September at three collieries. At Forthbank (Fife) there will be accommodation for 192 men, including a canteen and first-aid room, at a total cost of £11,813. At Winton (Lothians) there will be accommodation for 120 men, including a canteen and medical centre, the total cost being £11,413, while the installation at Brucefield (Fife) will accommodate 256 men and include a canteen and first-aid room at a total cost of £13,222. Extensions to existing installations were opened at Comrie and Blidworth collieries.

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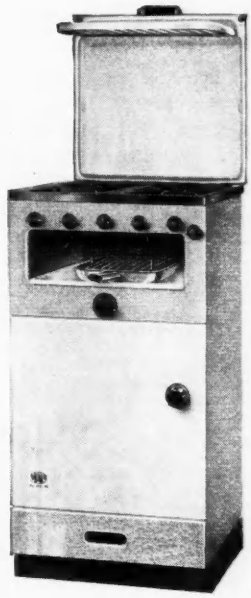
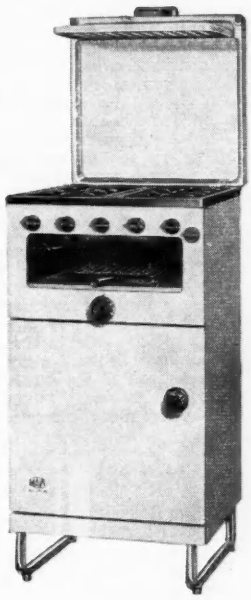
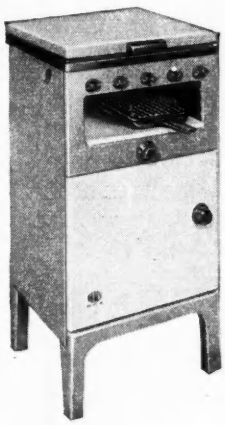


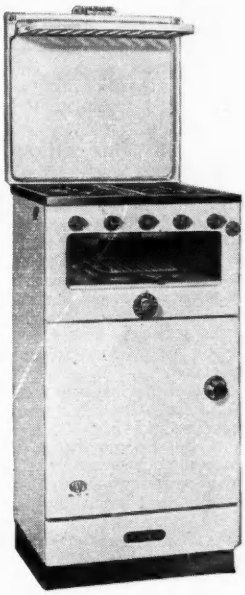
177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; plinth base; dapple/white finish.



177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; tubular legs; cream finish.

177 with hinged cover closed; 3 boiling burner hotplate; 14″ oven; cast iron legs; dapple/white finish.





177 with hinged cover and shelf; 4 boiling burner hotplate; 16″ oven; plinth base; cream/black finish.

CHOICE OF 177 FEATURES

Platerack and backplate, or short splashplate . . . Hinged cover with shelf . . . Oven heights: 14″ or 16″. (Portal, 14″ only) . . . Hotplates with 3 or 4 boiling burners and a high-speed grill . . . Cast iron legs, plinth base or tubular legs . . . finishes are in dapple/white, or cream/black.

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GAS DISTRIBUTION—MODERN METHODS OF CONTROL

Following is our report of the discussion on the paper on 'Gas Distribution: Modern Methods of Control' presented by Mr. T. W. Aiken, Chief District Engineer, and Mr. B. I. Stone, Assistant London Manager, of the Bryan Donkin Company, Ltd., at a meeting of the Southern Association of Gas Engineers and Managers (Eastern District) on October 18. The paper was published in the *Journal* of October 26 and November 2 (pp. 244-250 and 300-307)

THE **Chairman** (Lieut.-Colonel J. A. Gould) said the authors had had considerable experience in adapting new devices for the control of gas distribution plant. Developments in distribution had called for an extended use of governors, automatic devices, and remote control, and he was sure the methods described in the paper would be of interest and assistance to engineers in dealing with the supply problems which confronted the industry in respect of the linking of undertakings, the extension of supply in rural areas and other matters. He had had practical experience of many of the governor controls referred to, and was particularly glad to see the self-loading pilot governor shown in Fig. 4. He had had very good experience of its use in loading a 12 in. Reynolds governor to meet a peak load of 170,000 cu.ft. per hour. They operated the governor by the differential pressure across an orifice plate which was already being used in connection with a Kent's flow meter; it was therefore unnecessary to fit a venturi. He had compared the drawing of the Donkin Hanson patent auto-pilot clock controlled governor with the drawing of a similar device in 'Governors and Governing,' by Parkinson (Walter King, Ltd.), and had found considerable differences—a point which should be borne in mind by those interested in the device.

The Gas Light Area

Mr. **H. J. Escreet** (North Thames Gas Board) said very few Reynolds governors were used on the Gas Light area, although actually the first governor he had anything to do with in 1920 was a Reynolds, and two or three more were fixed in the following year. Then they went over to the mercurial type, chiefly because they put their district governors in pits rather than in kiosks. The Reynolds governor for a 12 in. or 18 in. main took up a lot of room and needed a large pit. Reynolds governors which they had had in action for nearly 30 years had given remarkably little trouble and the diaphragms were extremely reliable, requiring changing only about once in five years. He had been rather surprised to read in a recent North British Association paper that at Dundee they had had trouble with diaphragms and had put in mercurial governors in series with their diaphragm governors.

Mr. **P. Richbell** (South Eastern Gas Board) thought the automatic pressure control for peak loads was a very simple method of control for installation in outlying districts, but he was not quite sure that it could be adapted in congested areas where the governors were situated in pits and the clock control mechanism was fitted in kiosks in the public highway, on account of the release of the small volume of gas to the atmosphere. A similar method of control was in use in his district for effecting the same purpose, but they had used a Perfecta pressure cut-off which obviated the necessity of any release of gas to atmosphere. The method had been working quite satisfactorily for some considerable time. With the control method in use, increase in pressure when the mechanism came into operation was more or less instantaneous, whereas a gradual increase of pressure would be much more desirable from the district point of view. He wondered whether the slow acting cam on the clock would overcome the sudden rise in pressure.

Auto-Pilot Governor

With regard to the Donkin Hanson auto-pilot governor, his undertaking experimented with one of the earliest machines produced. It certainly had a considerably advantage over other types in that the pressures could be varied throughout the week to meet the district demands. The general behaviour of the governor was quite satisfactory over a range of 4 in. variation in pressure. They also carried out experiments using an inspirator as described later in the paper, but owing to the volume of gas which had to be passed through the inspirator to make it function satisfactorily it was found that it would be necessary to use a larger valve on the Hanson controller than that required for operating it under the method to which he had referred. The authors would probably say that as the result of experiments they had designed a new type of valve for this purpose, but he had not had an opportunity of carrying out any tests under such revised conditions. The point was fairly conclusively proved by substituting a larger valve for the normal one included in the mechanism.

His undertaking had installed equipment for the automatic pressure control of compressors and boosters on a 2 mill. cu.ft. per hour boosting plant at the works, and he understood from the station engineer that it was functioning in a satisfactory manner and relieved the attendant on duty of the necessity of carrying out any manual operation, particularly during periods of peak demand. With regard to feeder main supplies to outlying districts, he had read with a good deal of interest the authors' suggestions with regard to methods of operating holders and feeding outlying districts.

Integration in the South West

Mr. **T. W. Jackson** (Torquay) said they were much concerned in the south-west at present with schemes for the integration of supplies, some of which were planned 18 months ago and were actually under construction. At Torquay, where he was previously distribution engineer, four outlying stations were being equipped with volumetric governors and automatic boosters. Most of the schemes under consideration entailed the distribution of gas through country areas to widely dispersed stations, some with relatively small demands, and the use of automatic devices was essentially an important consideration.

In a high pressure feeder system the ideal of a constant output from the compressor over a 24-hour period was much to be desired, both from a production and distribution viewpoint, but in practice, particularly in new integration schemes where the feeder mains afforded supplies to new communities which previously had no gas supply, it was quite impossible to avoid peak load conditions. In such circumstances it became important to minimise the peaks. The authors had mentioned two methods employing automatic devices for dealing with coincident peak loads, but both methods presupposed that there was adequate storage capacity in the system as a whole. That was most often not the case, and that was a point to be borne in mind when designing high pressure systems. In many of the smaller works the storage was inadequate and could not meet existing peaks; that was evident from recent district pressure surveys in some country areas. The obvious answer was to increase the storage capacity at those stations, but this involved a high capital expenditure, and even if it could be justified it would be four to five years before new holders could be put into commission.

Using Available Storage

Full use could be made of available storage by the installation of a fan-type booster on the holder outlet so that a constant inlet pressure was maintained at the station governor, irrespective of the position of the holder lifts. The booster could be operated automatically by pressure control devices as described in the paper. Problems of distributing gas from one or more manufacturing centres to holder stations spread over a wide area had been made easier by the methods of flow control described in the paper, and better control was obtained by the use of volumetric governors, with their necessary safety devices, than by the older method of employing excess pressure governors at various stations, or the 'help yourself' method which had been common practice in the past. Facilities for the remote control of such equipment were comprehensive and he agreed that a much better control over the whole system could be effected from a central control room than by indi-

vidual control at the stations, although the latter could be effectively applied if operators were strictly disciplined to the system.

Mr. **H. B. Taylor** (Nottingham Sub-Division, East Midlands Gas Board) said the whole paper really dealt with the development of the old Reynolds governor. After about a century of existence it attracted new interest about 12 years ago when attention was concentrated on its use in connection with remote control for grid supplies. Since that time the company with which the authors were associated had done a very creditable piece of work for the industry, but they had not yet got anywhere near finality. It was impossible to get any one man who could understand all the devices described, and they had to beware that the makers did not sell them a complete robot; nevertheless, they had to keep on trying to find something which would work continuously. They also had to find the type of man who could understand what was going on inside such devices. In his own case a traction engine driver formerly employed by a circus had proved to be one of their best fitters.

Mr. **E. O. Rose** (Tottenham Division, Eastern Gas Board) said similar systems had been developed in his division, using another type of governor. He had been looking into the 'push button business' of remote control in connection with one of their systems, and at a very rough estimate it was likely to work out at £2,000 per station. Such expenditure might be justified where there was a large number of holder stations. Where the high pressure system did the double duty of supplying holders and governors it was very necessary to have some control from each of the outlying governors to maintain adequate pressure in the mains.

Mr. **L. J. Clark** (North Thames Gas Board), referring to the self loading governor, said another application of the same principle was the self loading booster, which he believed also came from the Continent. It was common to find boosters controlled by orifice plates in the discharge main, the pressures being arranged to suit the distribution demand. A development of that principle, with a slightly different application, was the use of a turbo type of machine in cases where it was desired to control the volume discharge regardless of the pressure.

Mr. **H. G. Bowden** (Elliott Brothers (London), Ltd.), who said he had attended at the invitation of Mr. W. A. Barnett, who was not himself able to be present, said the paper mentioned only one system of remote control, and he felt it should be mentioned that there were others. They were not necessarily of an elaborate type with large control boards, diagrams, and flashing lights. It was possible to have a small system which conveyed reliably just one or two readings and which performed controlling functions over considerable distances, with economies in cost by using Post Office telephone lines.

Mr. **A. S. Bromley** (Western Division, Southern Gas Board) said the Donkin Hanson device originated from the lamp control clock, initial experiments on its prototype having been conducted at the Coventry gasworks. One difficulty encountered in the early days was that it tended to load but not to unload, but that was cured by a better arrangement of the loading device. With regard to the cost of remote control systems he had ascertained that the cost of a Post Office line over a distance of eight miles was anything from £27 to £30 a year, and the system was not 100% foolproof.

Mr. **Aiken,** in a brief reply, referred to the Chairman's remark that the diagram of the Donkin Hanson device differed from that in Mr. Parkinson's book and remarked: 'We do not stand still; we try to go forward.' He went on to say that one difficulty was to get people to understand the functions of a governor and to be able to see that it was working properly just by looking at it. Mr. Richbell had mentioned the release to atmosphere of a small quantity of gas in the system shown in Fig. 2. The amount was very small, only a fraction of a cu.ft., and if it was carried away by a standpipe there was no need to worry.

Mr. **Stone** also dealt with some of the points raised in the discussion, and said that if storage was ample, the extraneous methods described in the paper became more or less unnecessary. Very few undertakings, however, had adequate storage; by the judicious use of information brought to headquarters by means of modern equipment they could save considerable expenditure on holders. While they had tried to standardise a complete remote control system they realised that many people had different ideas, and he could mention the names of several reputable manufacturing firms who produced highly satisfactory systems. In answer to Mr. Clark he said they had controlled pressures volumetrically for years; they preset pressures to pass a fixed volume into a grid.

A vote of thanks was accorded to the authors on the proposition of Mr. **J. W. Townsend** (Tunbridge Wells), seconded by Mr. **W. T. Houston** (Wandsworth).

POORER COKING COALS

In a paper on 'The Coking Industry, with Special Reference to Britain,' prepared for the United Nations Economic and Social Council, D. Hicks and G. W. Lee state that with a possible decline in the availability of the best coking coals attention will have to be given to the manufacture of coke of consistent quality from the poorer coking coals. This will involve substantial improvements in blending and closer attention to carbonising practice. A sub-committee of the British Coke Research Association has studied the question of coke oven dimensions in relation to coal and coke quality and has reached the following conclusions: (1) The quality of any given coke is determined principally by the characteristics of the coal from which it is produced; (2) variations in the width of the oven between approximately 16 in. and 19 in. does not materially affect the shatter and abrasion indices, provided the carbonising rate is the same, but wider ovens produce a greater proportion of large size coke; (3) for a given coal, an increase in the carbonising rate results in a decrease in the shatter indices and the size of the coke produced; (4) the height of the oven between approximately 10 ft. and 15 ft. does not materially effect the shatter and abrasion indices; (5) fine grinding associated with decrease of bulk density in modern top-charging practice increases shatter indices.

Although admitting no overall standards in regard to the properties of blast-furnace coke, the authors point out salient points of coke quality: Blast furnace coke should not be less than about 1 in. size, allowing a tolerance of 5%. The moisture content should not exceed 3% and variations should be avoided. The ash content must be uniform within a tolerance of 1%, and should not exceed 10%. Coke strength should show, at least, 85% on 1½ in. shatter test; the ½ in. shatter index should not fall below 97%. The sulphur content should be as low as possible.

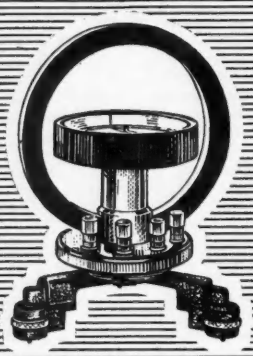
CORROSION OF GAS MAINS

In his report for 1948, just published by H.M. Stationery Office (price 2s.), the Director of the Chemical Research Laboratory, Dr. R. P. Linstead, C.B.E., mentions that during the period under review Mr. H. J. Escreet, Distributing Engineer of the former Gas Light and Coke Company, exposed 10 sections of gas mains at various parts in the South Essex area. The area, he explains, was one in which considerable trouble due to corrosion in clay soils had been experienced with steel, but little with cast iron pipes. The particular localities had been chosen with the purpose of showing typical examples of corrosive sites and, equally important, non-corrosive areas, all in clay. All the sites were excavated and examined on the same day. Samples of soil were taken at each site and examined later at the Chemical Research Laboratory. The condition of the exposed pipes and of any protective coating, the moisture conditions and general character of the soil were noted, together with information on the incidence of corrosion in the neighbourhood.

Evidence obtained during the tour of inspection and as a result of later examination of samples showed that:

(1) Sulphate-reducing bacteria were present in all the soils, whether aggressive or not. In all areas where leaks had occurred there was evidence of their activities, as shown by blackening of the surrounding clay.
(2) Wet conditions in the clay were common to all areas in which leaks due to pitting were prevalent. The importance of such conditions was strikingly shown by comparison of two sections of the same main running through the same type of clay; the wet section had given considerable leakage trouble, the other, which was well drained and much dryer, was free from corrosion.
(3) The bitumen-impregnated hessian wrappings used for protecting the steel pipes were, with one exception, rotten and brittle after 10-20 years' service.
(4) Leakages due to corrosion in chalk are very few in comparison with those in clay.
(5) In gas systems buried in clay, cast iron pipes are very much less subject to failure than steel pipes. True comparison is complicated by the difference in thickness between steel and cast iron pipes and also by the difference in type of corrosion—*i.e.*, pitting and graphitisation.
(6) In clay soils, the corrosion of cast iron pipes conveying gas appears to be less severe than that of similar pipes conveying water. More data are being collected to test this observation.

METERS THAT MATTER



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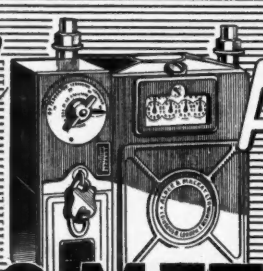

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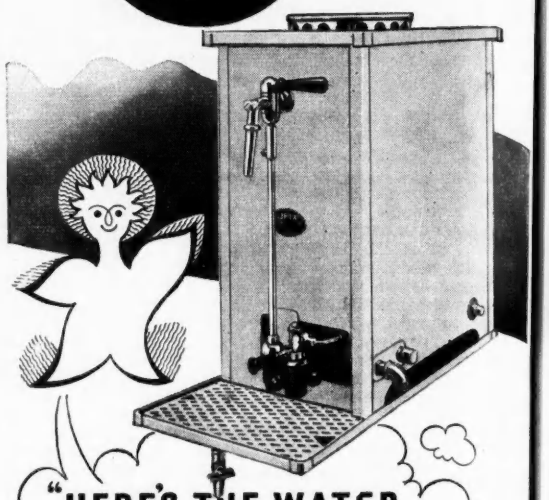

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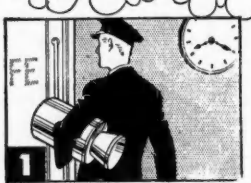

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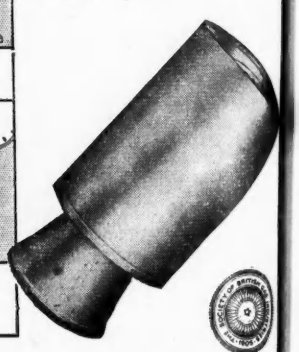

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